

THE SCIENTIFIC APPROACH TO BUILDING MUSCLE, LOSING FAT,
ENHANCING PERFORMANCE AND STAYING HEALTHY

VOLUME 13, NUMBER 6

FITNESSRX FOR MEN

NOVEMBER 2015

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Adjunct Professor of Kinesiology, Cal State San Bernardino

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Andy Fidino—Eugene, OR



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BUILD MAXIMUM MUSCLE, POWER & STRENGTH

This month's issue of *FitnessRx for Men* is all about maximizing muscle growth and taking your physique to the next level by building power, strength and enhancing fat loss. From a total body barbell routine to an extreme arm-blasting workout and much more, this issue is packed with hardcore training techniques and the latest scientific research on getting in your best shape.

Doing the same workout day in and day out gets boring. And besides, mixing things up in your training is what yields results. In "High-intensity Total Body Barbell Blast" by Allan Donnelly on page 42, our cover model Kyle Clarke demonstrates a high-intensity workout designed to increase strength, build muscle and power, improve core stability and burn body fat fast. This training program is broken up into a single 20- to 30-rep set of each exercise for a total of 300 reps. This is a workout that is designed to get fast results, so be sure to add it to your training regimen.

In the past, full-body training routines were the norm. Bodybuilding legend and movie star Steve "Hercules" Reeves worked all the major muscle groups during each workout, training three non-consecutive days per week. The idea was that frequently stimulating the muscles was the best way to increase muscle while avoiding overtraining. Soon, things began to change, and full-body routines gave way to training splits—the goal being to work a certain muscle using multiple sets and exercises, and then resting it for as much as a week before it's trained again. So which style of training is really the most effective? In "Split- vs. Full-Body Routines: Which Is Best for Maximal Muscle Growth?" by Brad Schoenfeld, Ph.D., CSCS, FNSCA on page 56, this special report reveals the science behind both split- and full-body routines and how to get the most out of your training.

Fitness model and Men's Physique competitor Sergi Constance knows what it takes to get great guns. In "Sergi Constance: The Ripped Man from Spain!" by Ron Harris on page 48, Sergi shares how he alternates between two different workouts for arms. One workout uses mostly free weights and movements where both arms are used at the same time as well as individually to ensure that one side never dominates. The second workout cranks up the intensity by incorporating supersets and stressing constant tension with cables. Give this program a try to really take your arm training to a whole new level.

When you're trying to maximize muscle recovery, should you use heat or cold? Both have different effects—cold reduces the temperature of the contacted area, causing constriction of the blood vessels, which reduces blood flow to the area. This, in turn, reduces the release of inflammatory cells to the site, minimizing overall inflammation, which can promote healing. On the other hand, heat triggers a small amount of inflammation required to repair the exercised muscle by inducing vasodilation, thus increasing the flow of blood and certain immunological cells to the area. The increase in immune cells to the area facilitates muscle tissue repair by removing damaged cells and additional cellular debris. In "Turning Up the Heat? Or Cold? For Muscle Strength and Growth" by Michael J. Rudolph, Ph.D. on page 60, find out what the research says about cold (cryotherapy) and heat (thermotherapy) so that you can have the best recovery.

The rest of the issue is packed with the latest cutting-edge scientifically backed research on training, nutrition and fat loss to help you increase muscle, power and strength and burn fat like never before. *FitnessRx* is your number-one source for building lean muscle, blasting fat, enhancing performance and staying healthy! And for more, don't forget to check out our website, www.fitnessrxformen.com.

Steve Blechman

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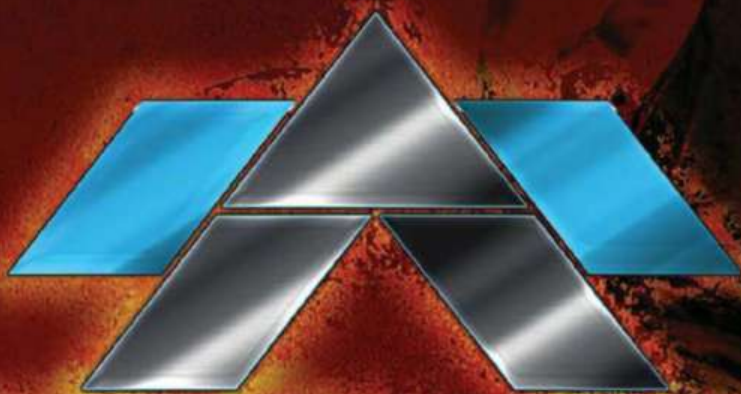
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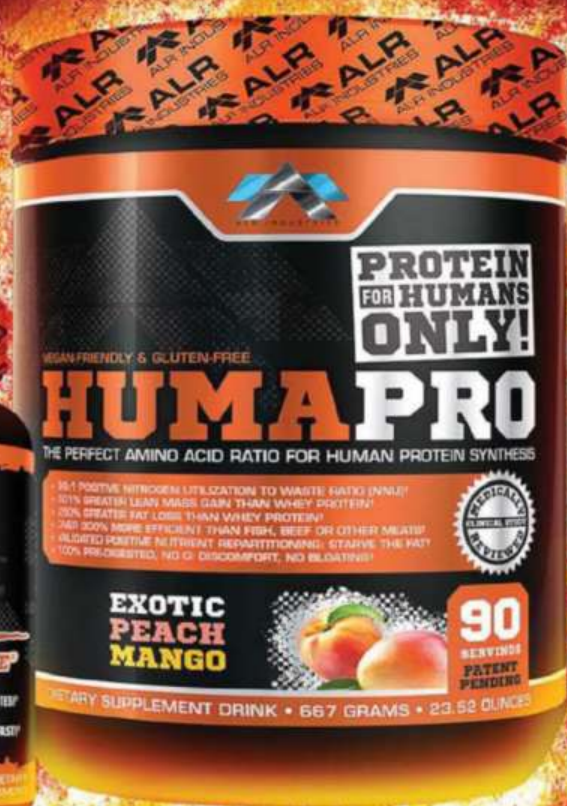
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SADIK'S REDEMPTION WORKOUT

Sadik Hadzovic is my fitness idol. When I saw his feature in FitnessRx ["The Redemption Workout: Push Your Body to the Max with Sadik Hadzovic's Muscle Building, Total Body-Blasting Routine," September 2015], I was so eager to read it, and I can tell you one thing— I was not disappointed. Sadik's redemption workout is something I now practice and preach. Thank you, FitnessRx, for amping up my training style with the feature on Sadik!

Tyler Hampton
Email

MEAL FREQUENCY AND FAT LOSS

There's so much conflicting information about how many meals we should be eating that it's hard to know what to follow. I'm glad that the article on meal frequency in the July issue helped to set the record straight ["Effect of Meal Frequency on Fat Loss," July 2015]. I just don't have the time to eat five times a day, so I was glad to see that three meals a day can still promote muscle growth and that spreading out protein intake helps with muscle protein synthesis. This is a lot easier to follow than having five meals every day!

Rich Mendoza, Email

CROSSFIT VS. WEIGHT TRAINING

Cross training and CrossFit just seem to be getting more and more popular, so I liked the article on cross training programs versus weight training ["CrossFit Vs. Weight Training: Which is Better for Building Lean Muscle, Power and Strength?" July 2015]. It was also helpful that it explained how to use weight training to *improve* in cross training workouts. I have tried CrossFit a few times but I also like to go to the gym on my own some days during the week, so I have been trying out the sample workout included here as well. Thanks as always, FitnessRx!

Ryan McCaskill, Email



GET BIG AND RIPPED

The Logan Franklin feature in the July issue is awesome ["Get Big And Ripped with Logan Franklin's High Volume, Total Body Workouts," July 2015]. I liked his advice on training with high volume— keeping the rest periods short and focusing on free-weight exercises. This seems to work for me and I like the improvements that I have been making. And his workouts are the real deal— every few weeks I have been changing it up and using Logan's training split. Awesome workouts! Thanks for the great advice.

Josh Ricker, Email



JEREMY'S PERFECT PHYSIQUE

I've been really hesitant about deciding whether or not I should go into my first Physique show. I've been conditioning hard but haven't found the right inspiration to give me that last push. After reading the article on Jeremy Buendia ["The Perfect Physique! How Physique Olympia Champion Jeremy Buendia Plans to Keep His Title," September 2015], I can now say that I have finally found my influence. This feature is everything you want and more when it comes to learning about the "perfect Physique body." Learning about Jeremy's own diets, workouts and overall back story really has helped me put my journey in its own perspective. I am thanking you, FitnessRx, for helping me make the right decision in entering my first Physique show this upcoming year. You guys rock!

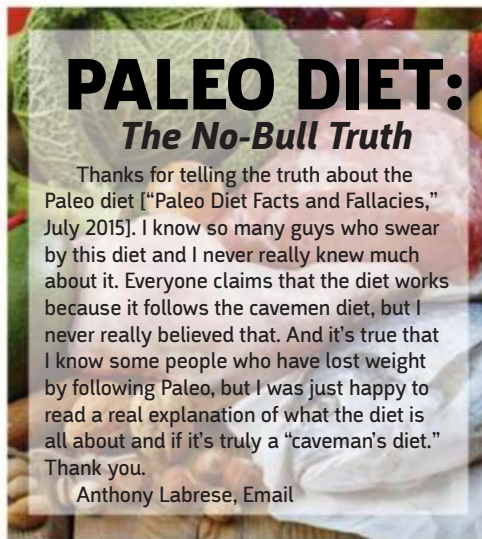
Mark Carey, Email



PALEO DIET: The No-Bull Truth

Thanks for telling the truth about the Paleo diet ["Paleo Diet Facts and Fallacies," July 2015]. I know so many guys who swear by this diet and I never really knew much about it. Everyone claims that the diet works because it follows the cavemen diet, but I never really believed that. And it's true that I know some people who have lost weight by following Paleo, but I was just happy to read a real explanation of what the diet is all about and if it's truly a "caveman's diet." Thank you.

Anthony Labrese, Email



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ARTICLES



STAY ON YOUR DIET—WHEREVER YOU ARE

Whether it's a job that requires you to travel frequently or a long weekend out of town, there are ways to go out on the road without completely derailing your fitness goals. Here are a few tips to help make sure you stay on track and reach your goals.



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FitRx **WARM UP**

● THE LATEST NEWS AND RESEARCH FROM THE WORLD OF FITNESS



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HIGH-REP KETTLEBELL SNATCHES

BUILD AEROBIC CAPACITY

A kettlebell is a large iron ball connected to a handle. There is nothing new about kettlebells. In the age before steroids, 19th-century strongmen such as Arthur Saxon, Eugene Sandow and Ivan Poddubny used them to build lean, powerful, lightning-fast physiques that allowed them to perform incredible feats of strength and athleticism. The kettlebell snatch is a key exercise in kettlebell training routines. The exercise appears simple, but requires coordinated, linked contractions of the thigh, butt, core and upper body muscles to do it properly. A study from San José State University led by Jonathan Asher Falatic and Peggy Plato found that a high-rep kettlebell workout (15 seconds of snatches followed by 15 seconds of rest for 20 minutes) improved aerobic capacity by 6 percent. For comparison, a control group practiced circuit training and made no improvement in aerobic capacity. Kettlebell workouts can potentially develop strength and aerobic fitness that will improve athletic performance. (Journal Strength Conditioning Research, 29: 1943-1947, 2015)

DOES ICE SPEED POST-EXERCISE HEALING?

The RICE principle—rest, ice, compression and elevation—has been the cornerstone of athletic injury management for the past 40 years. A study by scientists from Taiwan and the opinions of several leading orthopedic specialists have cast doubt on this treatment method. The Taiwanese study induced muscle damage using eccentric muscle contractions of the elbow extensors, and then applied ice for 15 minutes at zero, three, 24, 48 and 72 hours after exercise. **Compared to a control group, post-exercise icing caused greater fatigue and soreness.** Ice had no effect on immune system function. Before we toss out the baby with the ice water, this was a small study that used an isolated muscle group. Also, there were no differences in strength between the ice and control groups. A built-in bias in the study is the difficulty of finding a true control group for ice. We need more research before we take the “I” out of RICE. (Journal Strength Conditioning Research, 27:1354-1361, 2013)



Heavy-Load Squats Recruit More Motor Units Than Light-Load Squats to Failure

Motor units are trained in direct proportion to their recruitment (activation). Bill Kraemer and colleagues from The Ohio State University found that motor unit activation, as measured by peak EMG amplitude, was greatest when training at 90 percent of one-repetition maximum (1RM) to failure, compared to training at 70 percent or 50 percent of 1RM to failure. Maximize strength and hypertrophy by using heavier loads. (Journal Strength Conditioning Research, published online August 10, 2015)

HIIT REDUCES LIVER FAT AND IMPROVES BODY COMPOSITION IN FATTY LIVER DISEASE

Fatty liver disease involves fat accumulation in liver cells due to excessive alcohol intake, the metabolic syndrome or obesity. The metabolic syndrome is a collection of symptoms that include insulin resistance, abdominal fat deposition, high blood pressure, abnormal blood fats and type 2 diabetes. Fatty liver disease is reversible with lifestyle modification. Researchers from Newcastle University in the United Kingdom found that high-intensity interval training (HIIT) decreased liver fat, total body fat and improved liver enzyme levels in middle-aged patients. It also increased aerobic capacity. HIIT improves physical fitness rapidly and enhances metabolic health. (Clinical Science (London), published online August 11, 2015)

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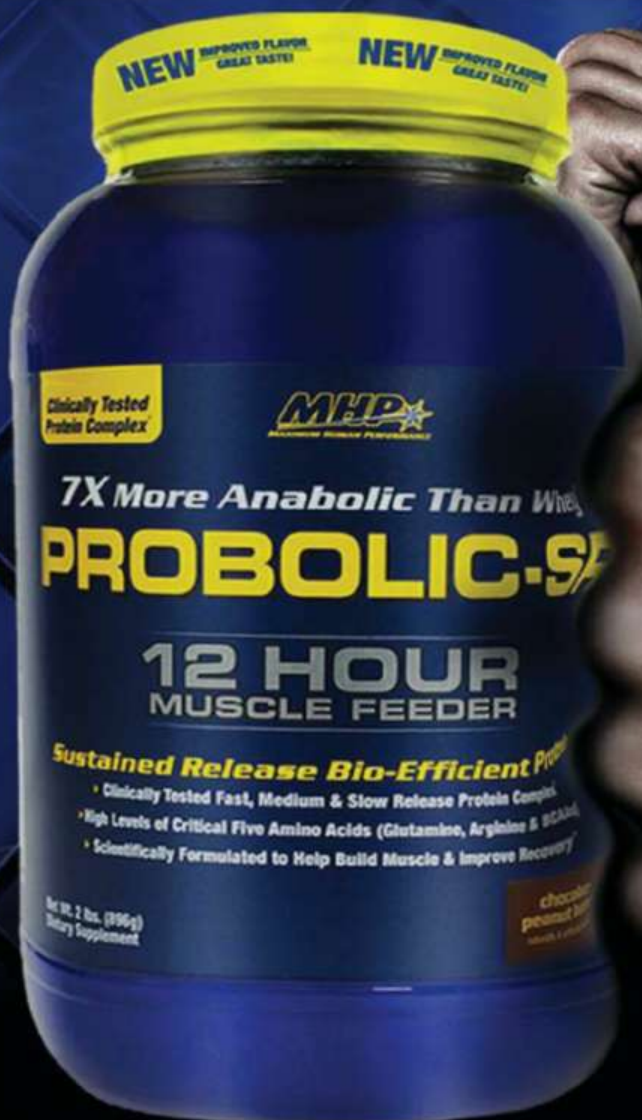
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Non-Motorized Treadmills Gaining Traction

In the 1950s, primitive gym treadmills were not motorized. They depended upon leg power to move the belt. Guess what? Non-motorized treadmills are back and they are popular in high-end gyms and CrossFit competitions. Today's non-motorized treadmills are more high-tech than the originals. People move the belts by moving their feet, but the belt speeds up as the person reaches the top of the treadmill, and slows down when he or she drifts backward. **The level of difficulty is about 30 percent greater with non-motorized treadmills at the same relative speed.** The belt speeds up or slows down according to the effort of the exerciser, which makes them excellent for high-intensity interval training workouts. They also cut down on injuries: the belt stops when the person stops. (The Wall Street Journal, July 6, 2015)

HANG POWER CLEANS INCREASE EXERCISE PERFORMANCE

The clean and jerk is a lift contested in the sport of weightlifting, often called Olympic lifting. Power cleans, involving racking the bar at chest level with only a slight knee bend, are a popular exercise, but can lead to injury if done incorrectly. The power clean involves two pulls: the first pull from the floor to knee level, and the second pulling the bar to chest level via a vigorous hip extension. Most beginning athletes extend their hips prematurely and have little power available for the second pull. The power clean from a hang is a better approach for athletes with little Olympic lifting experience, because it puts them in a powerful hip hinge position at the beginning of the exercise. William Haug and co-workers from the Australian Institute of Sport found that speed skaters made substantial improvements in leg power as measured by vertical jump during the first four weeks of learning the hang power clean. Power athletes such as throwers, sprinters and football players are not weightlifters. It is best to use weightlifting exercises that will transfer quickly to the playing field, with a minimal risk of injury and a short learning curve. The hang power clean is an excellent lift for power athletes. (Journal Strength Conditioning Research, 29: 1766-1779, 2015)



SHORT REST INTERVALS CONDITION BEST DURING BATTLING ROPES EXERCISE

Battling rope exercises involve oscillating two large ropes, either one rope at a time or both ropes at the same time. They are excellent functional training exercises that require explosive movements in the athletic position. Nicholas Ratamess and co-workers from the College of New Jersey found that battling rope exercises increased oxygen uptake above 50 percent of maximum, and that one-arm exercises were more stressful than using two arms. **The greatest energy loads occurred when using one-minute rest intervals compared to two minutes.** Battling rope exercises provide a significant metabolic stress and are effective conditioning exercises. (Journal Strength Conditioning Research, published online May 30, 2015)

TRAIN FREQUENTLY FOR GREATER HYPERTROPHY

Whole-body workouts practiced three days per week were superior to split workouts emphasizing specific muscle groups one time per week (worked out three times per week)—according to a study led by Brad Schoenfeld from CUNY Lehman College in New York. **The idea behind split routines is that they allow athletes to train specific muscle groups more intensely, while performing the same training volume.** Some believe they may promote muscle growth, enhance neuromuscular performance and prevent overtraining. This study showed that hitting muscle groups more frequently might produce more hypertrophy. The study used college students who were relatively untrained, so it is difficult to determine if the results apply to elite bodybuilders. (Journal Strength Conditioning Research, 29: 1821-1829, 2015)

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BEETROOT JUICE IMPROVES ENDURANCE AND CARDIOVASCULAR FUNCTION

Beetroot juice (BRJ) improves endurance capacity, boosts oxygen delivery and reduces the work of the heart during exercise— according to researchers from Korea and the University of California, Davis. College-aged males were fed beetroot juice or nitrate-depleted beetroot juice for 15 days. BRJ doubled blood nitric oxide, a critical chemical for controlling blood flow. **BRJ reduced systolic blood pressure, diastolic blood pressure, mean arterial pressure and total peripheral resistance at rest and during exercise.** It also lowered the load on the heart during exercise as measured by rate-pressure product (heart rate times systolic blood pressure). Beetroot juice is an important supplement for improving cardiovascular health and enhancing endurance capacity. Other studies have found that a single glass of beetroot juice increased performance in kayaking and cycling. (American Journal of Physiology Regulatory, Integrative and Comparative Physiology, published online June 17, 2015)

BETA-ALANINE IS AN EFFECTIVE SPORTS SUPPLEMENT

Alanine is an amino acid that helps supply energy during exercise. It is converted to blood sugar in the liver by a process called the glucose alanine cycle. While it is not used to synthesize muscle tissue or enzymes, it influences exercise capacity— particularly endurance performance. **The International Society of Sports Nutrition, in a position statement, concluded that alanine increases muscle carnosine levels and acts as an intracellular buffer.** Alanine is a safe supplement with few side effects. It improves exercise performance in exercise lasting one to four minutes. It reduces fatigue in older people and may be particularly beneficial when consumed with other supplements such as creatine monohydrate. (Journal International Society Sports Nutrition, 12: 30, 2015)



CAFFEINE BOOSTS PERFORMANCE

For more than 40 years, endurance athletes have been taking caffeine to improve endurance performance. Scientists thought that caffeine worked by increasing blood fats, which spared carbohydrates in the blood, muscles and liver. A study by Brazilian athletes concluded that caffeine improves endurance performance by sparing carbohydrates and increasing fat use. They supplemented six milligrams of caffeine per kilogram of bodyweight and measured endurance performance on a stationary bicycle while the test subjects were at maximal lactate steady-state— the maximum exercise intensity where lactate no longer increases. **Caffeine increased endurance performance by 22.7 percent.** Caffeine is a very effective supplement that improves performance during endurance and high-intensity events. Currently, caffeine is not restricted in Olympic sports but is regulated by the National Collegiate Athletic Association. (Nutrients, 7:5254-5264, 2015)



OMEGA-3 FATTY ACIDS BOOST MUSCLE MASS IN OLDER ADULTS

Fish oil high in omega-3 fatty acids may be an effective anti-aging supplement that prevents muscle loss and slows cell aging. Gordon Smith and colleagues from Washington University School of Medicine in St. Louis supplemented fish oil in 40 older adults for six months. Fish oil therapy slowed muscle loss normally occurring with age. Measures included thigh muscle volume, handgrip strength, one-repetition maximum on the leg press, chest press, knee extension and knee flexion. **Other recent studies found that omega-3s prevented telomere shortening in the cells, which promotes cell longevity.** Omega-3 fatty acid supplements may prevent muscle loss with aging and improve cell health and longevity. (American Journal Clinical Nutrition, 102:115-122, 2015)

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CAPSAICIN PROMOTES METABOLIC HEALTH

Capsaicin is a chemical found in red chili pepper used to make paprika, which is an ingredient in chili and Mexican food. It reduces appetite and calorie intake and helps promote weight loss by releasing serotonin, a hunger-suppressing hormone. A review of literature by Mark McCarty from Catalytic Longevity in California, and colleagues, concluded that capsaicin has favorable effects on atherosclerosis, metabolic syndrome, diabetes, fatty liver disease, heart enlargement, high blood pressure and the risk of stroke. It also has favorable effects on the endothelium—the inner lining of the blood vessels. Capsaicin is a heart-healthy supplement that promotes metabolic health. (Open Heart, 2: E000262, 2015)

HMB Improves Aerobic Capacity and Body Composition in Endurance Athletes

Beta-hydroxy-beta-methylbutyrate (HMB) is a metabolite of the amino acid leucine. Some studies found that HMB prevented muscle protein breakdown, stimulated muscle growth and promoted fat breakdown. Researchers from Poznan University in Poland found that rowers taking three grams of HMB daily for 12 weeks showed increases in maximal oxygen consumption, heart and breathing responses to exercise, and decreased fat mass compared to a placebo (fake HMB). HMB improves aerobic capacity, reduces body fat and increases peak power output, so it would be an effective supplement for endurance athletes. (Journal International Society Sports Nutrition 12: 31, 2015)

Leucine Plus Whey Protein Promotes Muscle Protein Synthesis After Intense Endurance Exercise

The amino acid leucine and whey protein consumed following weight training can trigger increases in muscle protein synthesis that promote muscle mass and strength. Endurance training does not cause increases in muscle mass, but it does cause tissue damage that must be repaired during recovery. David Rowlands from the University of Wellington in New Zealand, and colleagues, in a very sophisticated study, found that consuming five grams of leucine and 25 grams of whey protein after 100 minutes of intense cycling promoted muscle protein synthesis—which would help speed recovery and promote adaptation to exercise and improved fitness. Supplements containing leucine and protein consumed after exercise are good for endurance athletes. (Medicine Science Sports Exercise, 47: 547-555, 2015)

Citrulline Increases Abdominal Fat Burning

A French study on old rats led by Christophe Moinard from the University Paris Descartes showed that supplementing citrulline reduced abdominal fat levels and protected against age-related cell destruction. Citrulline is an amino acid that is converted to arginine, which increases levels of nitric oxide—an important chemical that regulates blood flow throughout the body. Citrulline also increases brown fat activity, which increases caloric expenditure and promotes fat burning. It does this without stimulating the sympathetic nervous system, which avoids increases in heart rate, blood pressure and anxiety. Citrulline increased levels of hormone-sensitive lipase by 150 percent, which promoted fat mobilization and use. Citrulline is an underappreciated supplement that improves fat burning and muscle blood flow. (Journal of Nutrition, 145:1429-1437, 2015)

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Testosterone Is Important For Body Composition Control

Testosterone is an important hormone for controlling obesity. Low testosterone levels are linked to increased total body fat, abdominal fat deposition and reduced muscle mass— according to a literature review by British researchers. These changes in body composition are linked to energy imbalance, impaired blood sugar control, decreased insulin sensitivity and abnormal blood fats. Testosterone replacement therapy helps restore normal body composition and improves motivation, energy levels and vigor, which enable men to lead more active lifestyles. (Obesity Reviews, 16: 581-606, 2015)



Lack of sleep disrupts energy balance, which determines whether you gain weight, lose weight or stay the same— according to a literature review and meta-analysis conducted by David Allison and colleagues from the University of Alabama at Birmingham. Sleep deprivation increases a hormone called ghrelin, which promotes appetite. It also reduces leptin, a hormone that normally suppresses appetite. **Some studies have found that inadequate sleep increased the risk of obesity by 200 percent.** Inadequate sleep was also linked to diabetes and high blood pressure. Sleep disturbances are surprisingly common in children and adults and can cause serious health problems, such as memory loss, coronary artery disease, stroke, daytime sleepiness and contribute to automobile and workplace accidents. See your physician for a sleep study if you have insomnia, snore loudly, stop breathing for 20 seconds or more during sleep or wake frequently at night. (Obesity Reviews, 16: 771-782, 2015)

Interval Training Has No Effect on Fat Oxidation

Interval training causes substantial increases in fitness and physiological capacity. **Recreationally active people improved aerobic and exercise capacity by 15 to 20 percent, glycogen storage by 28 percent and mitochondrial enzyme levels by 38 percent in only a few weeks of training.** Many people exercise to control body composition, but the effects of interval training on weight control are not clear. Danish researchers found that six weeks of high-intensity interval training (HIIT) increased maximal oxygen consumption substantially, but had no effect on fat metabolism in fat cells. HIIT increased mitochondria (cell powerhouses) in skeletal muscle but not in fat cells. HIIT is a terrific way to build aerobic capacity rapidly, but should be complemented by traditional aerobic training for optimal fat loss. (Scandinavian Journal Medicine Science Sports, 25: e59-e69, 2015)

WAKAME SEAWEED FIGHTS FAT

Wakame (brown) seaweed contains a chemical called fucoxanthin (FX) that inhibits fat cell growth and promotes fat release. A review of literature by scientists from the Ukraine and Korea noted that most studies on FX have examined its effect on rats and mice. To date, no large-scale studies have been done in humans. **Animal studies have shown that FX reduces total body fat and abdominal fat, promotes blood sugar control, prevents fat accumulation in the liver and improves the blood fat profile.** Some studies have found that FX increases blood fat activation and increases energy expenditure. Brown seaweed is a natural product with no known toxic effects. (Nutrition, Metabolism & Cardiovascular Diseases, published online June 3, 2015)



Resveratrol Promotes Brown Fat Formation



Red wine, grape seeds, blueberries and strawberries contain a powerful chemical called resveratrol that prevents cell damage, increases HDL (good cholesterol) and prevents blood clot formation and chronic inflammation. Studies on mice and rats found that resveratrol increased life span, prevented cancer and cardiovascular disease, and improved blood sugar regulation. Chinese researchers, in a study on mice, found that resveratrol promoted brown fat formation, which results in more calories dissipated as heat instead of stored as fat. Resveratrol has powerful effects on metabolism that could protect the body from premature aging. Resveratrol might be the Fountain of Youth among athletic food supplements. The researchers concluded that it was better to get resveratrol from foods rather than supplements. (International Journal Obesity, 39: 967-976, 2015)

FATHERHOOD MAKES YOU FAT

Body mass index is a measure of the proportion of weight to height ($BMI = \text{Weight} \div \text{height}^2$) and is a rough measure of body composition and obesity. Becoming a father increases BMI, regardless of whether the father lived with the child or not— according to a study led by Craig Garfield from the Northwestern University Feinberg School of Medicine in Chicago. Over time, non-fathers decreased BMI. They studied more than 10,000 men over a 20-year period. Fatherhood could increase their risk of diabetes, cardiovascular disease and premature death. (American Journal of Men's Health, published online July 21, 2015)

CAFFEINE AND ALBUTEROL Decrease Fat and Build Muscle

The combination of caffeine and albuterol reduces body fat and increases lean body mass— according to a study from the Pennington Biomedical Research Center in Baton Rouge, Louisiana. Their conclusions were based on a series of studies using cultured fat cells, rat and humans. In humans, the two drugs increased resting metabolic rate. **The combination of drugs had a greater effect than either drug alone.** The purpose of this study was to explore alternatives to caffeine and ephedra, which were removed from the market by the Food and Drug Administration (FDA). (Obesity, published online August 4, 2015)



FAT BURNING GREATEST AFTER AN OVERNIGHT FAST

Exercising following an overnight fast will burn more fat than exercising after breakfast, according to Korean researchers. Test subjects reported to the laboratory for a 30-minute treadmill run either fasted or after breakfast. When fasted, blood sugar was lower and free fatty acids, growth hormone and cortisol were higher than when they ate breakfast. Consistently exercising fasted in the morning should result in greater fat burning and fat loss than exercising after breakfast. (Journal of Physical Therapy Science, 27:1929-1932, 2015)

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SUGAR OR ARTIFICIAL SWEETENERS?

Artificial sweeteners have been around since the early 1960s, and have been controversial ever since. Aaron Carroll, a professor of pediatrics at Indiana University School of Medicine, discussed the relative benefits of sugar versus artificial sweeteners. Artificial sweeteners have been linked to cancer in laboratory animals, but these results have not been replicated in humans. In fact, large population studies and literature reviews have shown that these substances are safe. Excess sugar is another matter. **Fat and overall bodyweight increase with sugar intake, while increased use of artificial sweeteners results in lower bodyweight and less fat.** Overconsuming sugar increases the risk of type 2 diabetes, and doubles the chances of dying from cardiovascular disease. Excess sugar intake is unhealthy, while artificial sweeteners appear harmless. (The New York Times, August 10, 2015)



The Psychology of Selfies

Selfie sticks are the ultimate symbols of narcissism. Some psychologists have gone so far as to say that selfie stick users have narcissistic, psychopathic and Machiavellian personality traits. They have increased needs for self-gratification, particularly when they post their photos online. Frequent selfie stick users are insecure and score lower on measures of belonging and meaningful existence. These are the same people who get upset when they don't get "likes" on their Facebook entries. Other psychologists contend that selfies are just another form of communication. It's predictable that selfies would become fertile ground for psychobabble. (The New York Times, August 8, 2015)



IBUPROFEN AND ACETAMINOPHEN INHIBIT MUSCLE PROTEIN SYNTHESIS

Intense weight training often leaves athletes with sore joints and muscles. Many take drugs like ibuprofen and acetaminophen to cut the pain. This is a mistake. A study led by Todd Trapp and Eileen Weinheimer from Ball State University in Muncie, Indiana found that both drugs inhibited protein synthesis after weight training. These drugs block the production of cyclooxygenase (COX), which stimulates the production of inflammatory chemicals called prostaglandins. Inflammation is painful, but it is the body's way of coping with cell injury and irritation. **Some inflammation appears critical for promoting protein synthesis following weight training.** Bodybuilders should minimize the use of ibuprofen and acetaminophen. (American Journal of Physiology Regulatory, Integrative and Comparative Physiology, 292: R2241- R2248, 2007)



SPICY FOODS PREVENT PREMATURE DEATH

Eating spicy foods three to six days per week reduces death from all causes (deaths per year) and the risk of death from cancer, coronary artery disease and respiratory disease— according to researchers from China. They examined nearly 250,000 healthy men and women aged 30 to 79. **Eating spicy foods decreased the risk of premature death by about 14 percent. The effects of spicy foods on death rates were greatest in people who did not drink alcohol.** Spicy foods contain several chemicals such as capsaicin that have been linked to metabolic health and weight reduction. (British Medical Journal, 351: H 3942, 2015)



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DRINKING TOO MUCH WATER IS DEADLY

Commercial sports drinks have increased public awareness about the importance of adequate fluid intake during exercise. People often perceive that active people can't get enough water—particularly when exercising in the heat. They're wrong. **Drinking too much water is dangerous and can lead to water intoxication (hyponatremia), which can cause brain swelling and death within a few hours.** Excess water dilutes the electrolytes (sodium, potassium, chloride, magnesium) in the cells, which destroys the body's capacity to manage body fluids. The following principles will ensure that you consume the correct amount of water before, during and after exercise:

- Drink when you are thirsty. This will prevent dehydration and excessive water intake. Coffee, tea and carbonated drinks contribute to hydration, but should not be the primary fluid-replacement beverages.
- Salted fluids help replace lost electrolytes.
- Weigh yourself during workouts: limit weight loss to three percent; weight gains suggest overhydration and water intoxication.
- Take frequent water breaks.
- Don't drink too much water. Weight increase and swelling (bloating) during practice or competition can mean you are drinking too much. (Clinical Journal Sports Medicine, 25: 303-320, 2015)

FDA: NSAIDs INCREASE THE RISK OF HEART ATTACK, STROKE AND HEART FAILURE

The U.S. Food and Drug Administration (FDA) issued a warning that non-aspirin nonsteroidal anti-inflammatory drugs such as ibuprofen and naproxen increase the risk of stroke, heart attack and heart failure by 10 to 50 percent—depending upon dosage and health status. The risk of serious cardiovascular events is higher in people with established cardiovascular disease, but even healthy people are at risk. The FDA warning included prescription and over-the-counter NSAIDs. Other studies have shown that NSAIDs slow muscle hypertrophy. These drugs are widely used to fight pain and inflammation. Athletes should minimize the use of these drugs. (The New York Times, July 10, 2015)

LESS OBESITY AND DIABETES AT HIGH ALTITUDE

Colorado has the lowest obesity rate in the United States. Its high altitude might be one of the reasons. A study led by Orison Woolcott from Cedars-Sinai Medical Center in Los Angeles found that people living at high altitude (1,500 meters—the altitude of Denver, Colorado) showed lower blood sugar levels and lower sugar output from the liver. David Swanson, a researcher from Cal State University, Chico, noted that obesity rates were lowest in the Colorado counties with the highest altitudes. We do not currently understand the effects of altitude on the incidence of obesity or diabetes. (Endocrine News, June 2015)



MASSAGE IMPROVES PERFORMANCE AFTER EXERCISE-INDUCED MUSCLE DAMAGE

Fifteen minutes of massage to the calf muscles following muscle-damaging exercise resulted in greater muscle strength and proprioception, compared to a group receiving no massage—according to researchers from Korea. Proprioception is the perception of movement and spatial orientation of various parts of the body. Muscle damage was induced using eccentric contractions, which injure important parts of the muscle cells (Z lines) and trigger secondary inflammation. Delayed onset muscle soreness (DOMS) has been a serious challenge to muscle physiologists for more than 100 years. Treatments such as stretching, ice, heat, active exercise, nonsteroidal anti-inflammatory drugs and muscle relaxers have been largely ineffective. Post-exercise massage might help prevent DOMS. (Journal Strength Conditioning Research, 29: 2255-2260, 2015)





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GRAPEFRUIT AND ORANGE JUICE CONSUMPTION INCREASE THE RISK OF MELANOMA

People who drink large quantities of grapefruit juice or orange juice have an increased risk of malignant melanoma—according to researchers from Brown University in Rhode Island. These citrus fruits contain chemicals called psoralens that increase the skin's sensitivity to UV light exposure. These juices are high in potassium, folate, thiamine and vitamin C, so they are important parts of a healthy diet. If you like to consume these juices, use sunscreen, wear a hat and cover vulnerable areas. Each year, physicians in the United States diagnose 76,000 new cases of melanoma and report more than 9,700 deaths. The 10-year survival rate of untreated melanoma is approximately zero. (Journal of Clinical Oncology, published online June 29, 2015)



Eating Protein and Vegetables Before Carbs Promotes Blood Sugar Regulation

Eating vegetables and protein before carbohydrates resulted in lower post-meal blood sugar levels in overweight people with type 2 diabetes—according to a study led by Louis Aronne from Weill Cornell Medical College in New York City. **Preventing spikes in blood sugar in diabetics is important for preventing blood vessel disease that can lead to heart attack.** It is also important in athletes. Maintaining stable blood sugar helps prevent major shifts in energy levels and reduces fat deposition. A simple way of preventing blood glucose spikes is to consume your protein shake at the beginning of a meal. This will turn on biochemical pathways that promote muscle protein synthesis and prevent rapid increases in blood sugar. (Diabetes Care, 38: e98-e99, 2015)

Carbohydrate Mouth Rinse Fights Fatigue

Carbohydrate is the principal fuel at exercise intensities above 65 percent of maximum effort. Eating carbohydrates prevents fatigue during prolonged exercise. A study led by Matt Jensen from the University of Victoria in Canada found that a carbohydrate mouth rinse prevented fatigue by approximately 3 percent in athletes performing prolonged isometric knee extensions. Researchers concluded that a Nut Met Care, 13 carbohydrate mouth rinse might play a small role in preventing fatigue during exercise requiring high muscle tensions. British researchers (Curr Opin Clin Nutr Met Care, 13: 44, 2010) found that the nervous system senses carbohydrates as soon as they enter the mouth, and it boosts performance. However, other studies found no effects. It is likely that carbohydrate mouth rinses have only small effects on performance, if they work at all. (International Journal Sports Nutrition Exercise Metabolism, 25: 252-261, 2015)

Chemical in Salmon Improves Metabolic Health

The metabolic syndrome is characterized by insulin resistance, high blood pressure, abdominal fat deposition, abnormal blood fats and inflammation. Contributing factors include physical inactivity, poor diet and genetics. Geneviève Chevrier from Laval University in Canada, and co-workers, in a study on mice, found that chemicals in salmon improved the symptoms of the metabolic syndrome by improving blood sugar metabolism, decreasing inflammation and lowering blood triglycerides (fat). Salmon is a heart-healthy food that promotes metabolic health. (Journal of Nutrition, 145: 1415-1422, 2015)



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HIGHER PROTEIN INTAKE LINKED to *Higher Muscle Mass*

The Framingham Study examined public health issues, such as heart disease and arthritis, in people living in Framingham, Massachusetts. Muscle loss in older adults, a condition called sarcopenia, is a serious public health issue because it increases the risk of falls, diabetes and decreases the quality of life. **A sample of more than 2,500 men and women, aged 29 to 86, found a high relationship between protein intake and leg strength and muscle mass.** Many recent studies in older adults show that high protein intake stimulates muscle protein synthesis, even in the absence of exercise. The study shows the importance of maintaining adequate protein intake throughout life. (Journal of Nutrition, 145: 1569-1575, 2015)

Vitamin K Deficiency Linked to Prostate Enlargement

Vitamin K is involved in blood clotting and bone health. Michael Donaldson from the Hallelujah Acres Research Foundation speculated that vitamin K might also be important for promoting prostate health. One cause of prostate enlargement is the development of varicose veins in the urogenital tract, which concentrates testosterone and promotes prostate growth. Vitamin K is important for blood vessel health and might prevent vascular problems in vessels surrounding the prostate. At this point, his speculation is a hypothesis rather than a direction for treatment. (Medical Hypotheses, 84:219-222, 2015)

Beta-Alanine Supplements Increase Muscle Endurance *During Plyometrics*

Beta-alanine increased average jump height during repeated plyometric squat jumps— according to a study from the Free University of Brussels in Belgium. Alanine is an amino acid that helps supply energy during exercise. It is converted to blood sugar in the liver by a process called the glucose-alanine cycle. While it is not used to synthesize muscle tissue or enzymes, it influences exercise capacity— particularly endurance performance. Alanine prevents fatigue by increasing tissue carnosine levels. Carnosine is an important antioxidant that protects cells from destruction and buffers acids that cause fatigue. Other studies have found that alanine boosts weight-training endurance. The effective dose for alanine is about four to six grams per day. This supplement might have a small effect on increasing training stamina in the weight room. (Amino Acids, 47:1479-1483, 2015)



Omega-3 Fatty Acids Improve Neuromuscular Performance

Myelin is a nerve covering that speeds the rate of conduction of nerve impulses. The myelin covering increases when athletes learn skills, which makes movements faster, smoother and stronger. **Myelin is composed mainly of fat and water, so increasing intake of a high-quality fat might be beneficial to the nervous system in athletes.** Evan Lewis from the University of Toronto, and colleagues, found that supplementing omega-3 fatty acids for three weeks increased muscle activation, as measured by electromyography, and prevented fatigue during a maximum sprint test on a stationary bike (Wingate test). Test subjects took five milliliters of seal oil per day, which contained 375 milligrams of EPA, 230 milligrams of DPA and 510 milligrams of DHA. Athletes may benefit from omega-3 supplements, particularly when they are working on skill development. (Journal International Society Sports Nutrition, 12:28, 2015)





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Medicare Won't Support Sexuality in Older Adults

Sexual activity is central to happiness and quality of life—according to a study by David Blanchflower from Dartmouth College in New Hampshire and Andrew Oswald from the University of Warwick in Britain. Regular sexual activity helps maintain testosterone levels and prevents prostate cancer in aging men. Yet, Medicare won't fund treatment for their sexual problems. Congressman Steve King from Iowa called medications like Viagra "lifestyle drugs" and said, "Taxpayers wouldn't foot the tab for 'grandpa's Viagra.'" Erection problems are common in men over 60, with 70 percent of men over 70 unable to get or maintain erections. Erectile dysfunction goes hand-in-hand with diseases such as coronary artery disease and diabetes. Many middle- and lower-income retired people cannot afford Viagra at \$38 per pill. Congressman King's ageist attitude will no doubt change if the day comes when he can no longer get it up. (The New York Times, August 4, 2015)

Metabolic Syndrome Linked to Erectile Dysfunction

A meta-analysis conducted by Turkish researchers concluded that erectile dysfunction (ED) was 260 percent higher in men suffering from the metabolic syndrome, compared to metabolically healthy men. The metabolic syndrome is a group of health problems that includes insulin resistance, high blood pressure, type 2 diabetes, abnormal blood fats and abdominal obesity. It is a disease of energy use and storage, and is triggered by physical inactivity, overeating, poor diet and genetics. **ED was particularly prevalent in men with low testosterone levels and diabetes.** Treatments might include regular aerobic exercise, healthy diet, hormone replacement therapy and erection-promoting drugs such as Viagra. (Journal Sexual Medicine, 12: 1309-1318, 2015)



SHOCKWAVE TREATMENT IMPROVES ERECTIONS

Low-intensity shockwave treatment improved erection quality in 81 percent of men treated for six months. The treatment works by improving the quality and quantity of blood flow in the penis. Erectile dysfunction (ED) is mainly caused by blood vessel problems related to physical inactivity, poor diet, genetics and aging. Erectile dysfunction is usually treated by drugs such as Viagra and Cialis, which work by promoting nitric oxide release from the inner lining of the arteries in the penis. These drugs, however, will not compensate for diseased blood vessels. **Shockwave treatment improved blood vessel function rather than compensating for diseased tissue the way drugs do.** Regular exercise is one of the best ways to improve circulation in the penis. Men who practiced aerobics for 12 months experienced the same improvement in erection quality as those taking ED drugs. Shockwave treatment may be a viable alternative to drugs for treating erectile dysfunction. (International Journal Impotence Research, 27: 108-112, 2014)

Men love their penises, and spend a lot of time playing with them and looking at them. Equally important is the perception of others toward your penis. Swiss researchers from University Children's Hospital Zürich polled 105 women aged 16 to 45 about the importance of eight different penile characteristics. Women rated cosmetic appearance as most important, followed by girth and length. Other important factors included the appearance of pubic hair and the texture of the skin. None of the characteristics dominated the others, which shows that women appreciate a wide diversity of penises. (Journal Sexual Medicine, published online July 20, 2015)

IS YOUR PENIS PLEASING TO WOMEN?



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Testosterone Replacement Therapy Has No Effect on Ejaculation Dysfunction

Premature ejaculation is the most common sexual problem in young men. Some men, however, suffer from the opposite problem—ejaculation dysfunction. Problems include delayed ejaculation, failure to ejaculate, reduced ejaculate volume and decreased force of ejaculation. Darius Paduch from Cornell University Medical College, and co-workers, reported that testosterone supplements and testosterone replacement therapy had no effect on ejaculation dysfunction. They administered topical testosterone for 16 weeks to men with ejaculation abnormalities. (Journal of Clinical Endocrinology and Metabolism, published online July 9, 2015)



VIAGRA INCREASES THE RISK OF MALIGNANT MELANOMA

Melanoma is an aggressive form of skin cancer that kills nearly 10,000 Americans a year. The widespread use of tanning beds has increased the risk of the disease. Stacy Loeb from New York University, and colleagues, found that use of the erection-promoting drug Viagra (sildenafil) increased the risk of the deadly disease by 20 to 80 percent. There was no association in men with multiple prescriptions, so there is some doubt whether Viagra actually caused the disease. Erectile dysfunction affects more than 300 million men worldwide, and Viagra is the drug of choice for many patients. Men taking these drugs should be particularly careful to use sunscreens, wear hats and avoid overexposure to the sun. (Journal of American Medical Association, 313: 2449-2455, 2015)

Erectile Dysfunction Linked to Diabetes

Many recent studies found that erectile dysfunction is an early warning sign of cardiovascular disease and heart attack. A study led by Sean Skeldon from the Center for Health Services and Policy in Vancouver, Canada found that **erectile dysfunction (ED) increased the risk of diabetes by 220 percent.** The researchers found no link between ED and high blood pressure or high blood cholesterol. Men with erectile dysfunction, particularly those in middle age, should be thoroughly screened for diabetes. (Annals of Family Medicine, 13: 331-335, 2015)



Sex Society Issues Guidelines for Treating Testosterone Deficiency

The International Society for Sexual Medicine convened a panel of experts to make recommendations for treating low testosterone levels. The group concluded that recent concerns about testosterone replacement therapy, prostate cancer and cardiovascular disease are unfounded. Testosterone supplements can impair fertility and sperm production, and reduce testicular volume. Men concerned with the reproductive side effects should not be treated with testosterone. The panel stressed that physicians must avoid treating the "worried well"—men who request testosterone replacement therapy but don't need it. The panel conceded that testosterone replacement therapy is in a state of flux and must be evaluated based on objective evidence. (Journal Sexual Medicine, published online July 12, 2015)



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To further validate the effectiveness of new Clinical Strength T-BOMB 3xtreme, MHP had the University of Tampa Human Performance Laboratory conduct a clinical study.* In this study, the goal was to test Clinical Strength T-BOMB 3xtreme on highly trained athletes (not the typical couch potatoes often used in other studies). MHP researchers wanted to test their formula in a setting that would be typical of its users' regimens. There were two groups of subjects: One group was given T-BOMB 3xtreme and the other group was given a placebo. Remarkably, the athletes using T-BOMB 3xtreme experienced significant improvements in their testosterone-to-estrogen ratio and showed a 32% increase in free testosterone with no estrogen increase. The placebo group showed no increase and in fact saw a decrease in testosterone and lean muscle. The researchers concluded that T-BOMB 3xtreme proved to be an effective formula for enhancing testosterone and keeping estrogen levels in check. The study also shows the vital importance of taking an effective testosterone enhancement for athletes who engage in intense exercise programs.



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* Results based on use of Clinical Strength T-BOMB II versus Placebo. Sharp, M., et al., "Effects of T-BOMB II on Hormone Profiles in Resistance Trained Men," 2014, submitted for publication.

A full-page photograph of a very muscular man in a gym. He is shirtless, showing his well-defined chest, abdominal muscles, and arms. He is holding a barbell across his upper back with both hands, in a rowing position. He is looking directly at the camera with a serious expression. He is wearing dark athletic shorts and colorful sneakers. The background shows various gym equipment and a dark, industrial-style setting with some lights.

HIGH- INTENSITY

TOTAL BODY BARBELL BLAST

BY ALLAN DONNELLY
PHOTOGRAPHY BY IAN SPANIER



BUILD MUSCLE, POWER AND STRENGTH FAST WITH KYLE CLARKE'S TOTAL BODY ROUTINE

Let's face it—doing the same thing day after day gets boring. Even the most disciplined and motivated athletes in the world need to constantly mix things up in order to maintain their focus, stay enthused about their training and keep seeing results.

So why should you be any different?

Of course, there's nothing wrong with the traditional training splits and working one to two body parts a day for 12 to 20 total sets per muscle group, especially if you are seeing consistent results. But as the saying goes, "Everything works, but nothing works forever." So if you've hit a plateau either mentally or physically,

then you're likely overdue for a change of pace.

And that's just what we have here, courtesy of fitness model and actor Kyle Clarke. Kyle's Total Body Barbell 300 Workout is a high-intensity mash-up designed to increase strength, build muscle, improve core stability and, yes— even burn off body fat.

BUILDING STRENGTH AND SIZE

The concept is simple— you, a barbell and 45 to 60 minutes of your time. Getting to 300 reps with some of the toughest multi-joint barbell exercises ever created? Not so simple.

Clarke's workout, which is broken up into a single 20- to 30-rep set of each exercise for a total of 300 reps, is designed to target all of the major muscle groups with some of the most effective mass-building exercises for each body part. The workout is broken up into three modified tri-sets— three exercises performed back-to-back-to-back with little to no rest until the third set is completed.

"Most of exercises are compound movements working the larger muscle groups and fast-twitch muscle fibers," Clarke says. "Legs, chest, back, shoulders, biceps, triceps and abs— nothing is left out."



Why are compound movements important? First and foremost, you're looking to build muscle. And while isolation exercises like cable crossovers or leg extensions are important, they pale in comparison to the mass-building effects of the exercises included in this workout. Squats, deadlifts, rows, presses— all require total-body effort and multiple muscle groups to perform.

"You're able to lift a lot more weight using a barbell than you are using dumbbells or machines," Clarke says. "So you can really focus on building your strength and going heavy with each exercise."

Even though you'll be moving quickly during the workout, it doesn't mean you're going to lift heavy. Clarke recommends using 70 percent of your one-rep max (1RM) for each exercise. Even though the routine may resemble a cross-training workout in many ways, Kyle says to avoid challenging yourself by completing the workout within a specific amount of time.

"I would rather focus on putting more weight on the bar than the actual time it takes to finish the workout," Clarke says. "But no rest periods should be longer than 45 seconds."

BURNING FAT

It's common knowledge that exercise burns calories. What some people don't realize is that— depending on the type and intensity of that exercise— our bodies can continue to burn calories for up to 24 to 38 hours after a workout due to a process known as excess post-exercise oxygen consumption (EPOC).

Three of the best ways to elevate the EPOC effect? Circuit training, heavy resistance training with short rest intervals and high-intensity interval training (HIIT).

"This is going to burn a lot of calories, since you are basically using all of the muscles in your entire body," Kyle says. "Combined with the pace, you are going to be burning calories for two days after the workout is over."

LUNGE

Muscles Activated: Quadriceps, Hamstrings, Glutes, Calves

Set up in a power rack, the same as you would for the squat, but step further back after securing the barbell on your shoulders. Keeping your feet about shoulder-width apart and upper body erect, step forward with your left leg and sink down by bending your front knee until it is parallel with the floor. Allow your back knee to bend until it is about an inch from the ground; do not let your front knee travel over your front toe. Pause, then push through your heel to drive your body back to the starting position. Repeat for reps, then switch legs.



SQUAT

Muscles Activated: Quadriceps, Hamstrings, Glutes, Calves, Lower Back

Step under a barbell in a power rack with the bar set just below shoulder level. Place the back of your shoulders under the bar and reach up to grip it with both hands. Straighten your legs to lift the bar from the rack and step back one or two paces, feet positioned about shoulder-width apart. Keeping your upper body erect and head up, bend your knees and squat down until your thighs are at or slightly below parallel with the floor. Push up through your heels to the starting position and repeat.

THE WORKOUT

You'll use 70 percent of your 1RM for each exercise the first time you do the workout. If you don't know that number, there are plenty of online calculators to help you figure that out, but here's the easiest way we found:

- Take the number of reps you can perform on an exercise before reaching muscle failure and multiply that number by .033.
- Add 1 to that number.
- Take that number and multiply the weight you used to reach that number of reps.
- Your 1RM should be within five pounds of that number.

Since you'll be performing one set of 20 to 30 reps of each exercise, you obviously won't be reaching that number using 70 percent of your 1RM without taking a break during the exercise—otherwise known as the rest-pause intensity technique.

"If you can do 30 reps straight, then you're not challenging yourself and you need to increase the weight," Clarke says. "For squats, let's say you can get 15 reps without resting. Rest for 30 seconds after getting 15, then do another 10 reps. Rest for another 30 seconds, then complete the last five reps. Rest for a minute after that, then move on to the next exercise."

The exercises are broken up into three modified tri-sets, as follows:

Tri-set 1: Squat, Lunge, Deadlift

Tri-set 2: Bent-over Row, Barbell Curl, Barbell Dip

Tri-set 3: Incline Barbell Press, Shrug, Barbell Roll-out

Tri-set 1 involves the most multi-joint movements, so it comes first to set the tone for the rest of the workout. Make sure to warm up properly with five minutes of walking on the treadmill or dynamic stretching to loosen up and prevent injury.

"Legs are the largest muscle group in



DEADLIFT

Muscles Activated: Lower Back, Hamstrings, Glutes, Quadriceps

Place the barbell on the ground and stand in front of it, feet about shoulder-width apart. Reach down and grab the bar with a grip slightly outside your legs with an overhand or alternating grip. Bend your knees and drop your hips until your shins touch the barbell, keeping your head and eyes up and back straight. Push through your heels to stand up holding the bar in one fluid motion, leading with your head and keeping your back straight. Thrust your hips and contract your back as the bar rises above knee level. Pause, then bend at the knees to lower the bar back in a controlled motion to the starting position.

"COMBINED WITH THE PACE, YOU ARE GOING TO BE BURNING CALORIES FOR TWO DAYS AFTER THE WORKOUT IS OVER."

BENT-OVER ROW (NOT PICTURED)

Muscles Activated: Middle Back, Lats, Biceps

Grab a barbell with an overhand grip and bend your knees slightly, bending at the waist until your upper body is nearly parallel with the floor. Keeping your upper body in a locked position and head up, row the barbell up toward your navel, keeping your elbows in close to the sides of your body. Pause and squeeze your shoulder blades together, then lower the weight to the starting position.

the body and deadlifts are basically a total-body exercise, so they're grouped together to get the blood flowing and get your heart rate up right from the start," Clarke says.

Once you complete a tri-set, take around a minute to 90 seconds before beginning the next one. If you need more time, take it or consider decreasing the weight so you don't need as much rest.

Clarke recommends adding the workout to your routine once or twice a month to shock your body and mix things up. A few of Clarke's other recommendations include:

• **PLAN AHEAD:** "Since this is a total-body workout, take a rest day the day prior to doing this workout so your body is fresh. You definitely don't want to train

legs the day before this workout."

• **FEED THE MACHINE:** "Do this on a high-carb day so you give your body enough energy to make it through this."

• **CARDIO-FREE ZONE:** "This is a strength-focused workout. The total-body workout and exercises here will burn enough calories, so you won't need to do any cardio on this day."



STANDING BARBELL CURL

Muscles Activated: Biceps

Stand holding a barbell in front of your body, hands just slightly wider than shoulder-width apart. Keeping a slight bend in your knees, shoulders back, elbows close to your body and core tight, curl the barbell up toward your chest. Pause and squeeze at the top of the movement, then slowly lower the weight to the starting position.



BARBELL DIP

Muscles Activated: Triceps, Chest, Shoulders

Place a barbell in a power rack so it is in a locked position. If you do not have a power rack available, use a spotter to make sure the bar doesn't roll during the movement. Place your hands about shoulder-width apart on the bar and lift your legs off the floor so all of your weight is supported by your arms. Slowly lower your body toward the floor by bending at the elbows, keeping your upper body straight as you descend. Stop when your upper arms are at a 90-degree angle with the floor, then push your body back up to the starting position.



THE TOTAL BODY BARBELL 300 WORKOUT

EXERCISE	REPS
Tri-set 1	
Squat	30
Lunge	20 (each leg)
Deadlift	30
Tri-set 2	
Bent-over Row	30
Standing Curl	30
Barbell Dip	30
Tri-set 3	
Incline Bench Press	30
Shrug	30
Barbell Roll-out	30

INCLINE BENCH PRESS

Muscles Activated: Upper Chest, Shoulders, Triceps

Sit on an incline bench set to around a 30-degree angle. Lie back on the bench and grasp a barbell with hands slightly wider than shoulder-width grip and feet planted firmly on the floor. Take the barbell off the rack and hold it over your chest. Slowly lower the bar toward the top of your chest. Pause, then push the weight back up to the starting position.



SHRUG

Muscles Activated: Traps

Grab a barbell with an overhand grip, hands about shoulder-width apart. Hold the barbell in front of your thighs and let your shoulders hang loosely. Slowly shrug your shoulders upward, keeping the barbell close to your body as it travels upward. Pause and squeeze your traps, then lower the barbell back down to the starting position.



BARBELL ROLL-OUT

Muscles Activated: Abs

Kneel on the floor and grab a barbell with your hands slightly wider than shoulder-width apart. Keeping your back and arms straight and your core tight, slowly roll the barbell out in front of you until your arms are fully extended. Keeping everything tight and your neck in line with your spine, slowly roll the barbell back toward your knees.



KYLE CLARKE BIO

Height: 5'11"

Weight: 185

Sponsor: MRI Performance

KYLE'S SUPPLEMENT STACK

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9:30 a.m. (pre-workout): 1 scoop Black Powder Ultra

12:00 p.m. (post-workout): 2 scoops Pro-NOS

9:00 p.m.: 2 scoops Pro-NOS

SERGI CONSTANCE

THE ***RIPPED*** ***MAN*** **FROM** **SPAIN**

HOW HE TRAINS HIS AWESOME ARMS

THIS IS WHAT YOU WANT TO LOOK LIKE!

Of course, you've all seen movies like "Freaky Friday" where people switch bodies with each other. And we all know it's nothing but pure fantasy. But if you could switch bodies with another man, you couldn't do much better than fitness model and Men's Physique competitor Sergi Constance from Spain.

Sergi's popularity is growing every day, with more than 3 million likes on his Facebook page and close to a million followers on Instagram. At 6'1" and 207 pounds of shredded perfection, he pretty much has the total package: devastating good looks, rugged yet athletic muscularity, and that coveted exaggerated v-taper of broad shoulders and back tapering down to a tiny waist— with sculpted abs like rows of bricks. For a lot of us guys, arms are really what we crave. When it comes to powerful biceps and triceps, the 24-year-old Mr. Constance is especially blessed.

BY RON HARRIS • PHOTOGRAPHY BY MICHAEL NEVEUX

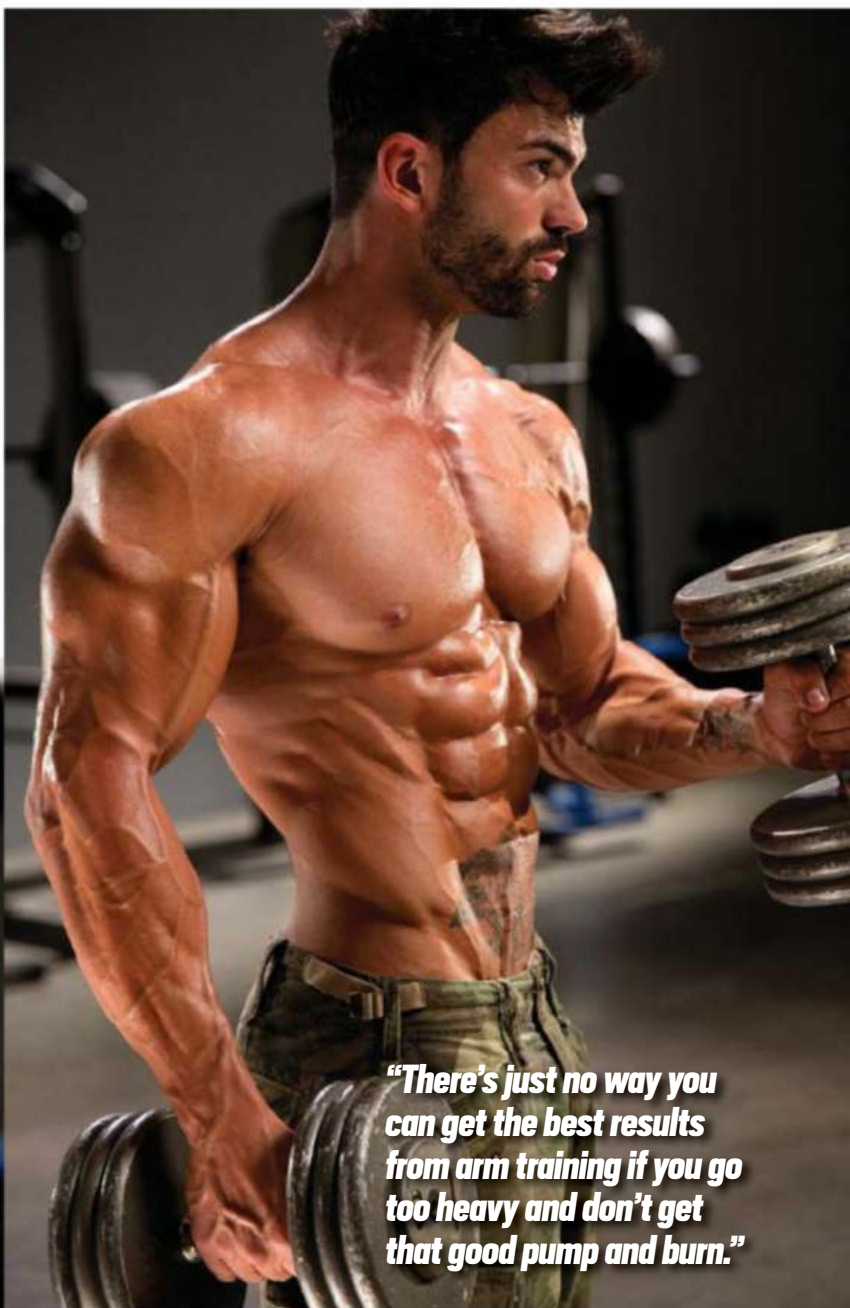


DESTINED FOR GREAT GUNS

We all have areas of our physiques that respond better than others. In Sergi's case, it's no surprise that his arms are where his genetic gifts seem to shine the brightest. "I do have stronger genetics for my arms, but this also presents a challenge, too," he observes. "It means that I need to work harder on all my other areas to make them grow."

Constance has always had a strong mind/muscle connection with his arms, and great pumps come easily once he is a couple exercises into a workout. To make sure they don't become too overpowering, as a balanced and proportionate physique is his goal at all times, he has skipped more than a few arm workouts in the last couple years. "I want a truly aesthetically pleasing body with all muscle groups in harmony," he explains. "This means that you have to ease up on your strong points at times and work harder on your weak points."

Sergi feels that arm training is actually easier in a sense, so the FitnessRx for Men readers seeking



"There's just no way you can get the best results from arm training if you go too heavy and don't get that good pump and burn."

better guns should take heart. "You can see and feel the biceps working any time you perform a set of curls," he points out. "That's not so easy to do with a muscle group like the lats."

BALANCING THE ARMS

Sergi is a stickler for detail and a true perfectionist, so even his arms are the subject of deeper scrutiny beyond how they compare to his physique as a whole. He feels it's important to objectively analyze the arms, noting strong and weak points as well as the balance between the biceps and triceps, so that your training can be adjusted accordingly.

"For me, a nice balance in the arm is 3:1, where the triceps should be that much bigger and pronounced than the biceps," he says. "In my case, my biceps have always had a tendency to be bigger in proportion to my triceps than I feel is the ideal. Because of this, I put more emphasis in my training toward my triceps so that they can catch up and get to where I want them to be visually."

BICEPS

BARBELL CURL

This is the most basic and most productive of all biceps exercises. Sergi likes to take a shoulder-width grip on the bar, taking care to keep his elbows tucked at his sides as he smoothly curls from a full stretch of the biceps up to a full contraction. Each rep is smooth and controlled, with a squeeze at the top before reversing direction.

EZ BAR CURL

The cambered shape of the EZ-curl bar makes it possible to target different parts of the biceps by varying hand position. Often, Sergi likes to use a more narrow grip as shown here, which puts greater emphasis on the inner or short head of the biceps. This is the segment of the muscle you show off when you throw up your arm for a quick flex.

DUMBBELL HAMMER CURL

For complete development of the upper arms, you also have to give some direct work to the brachialis muscle, which lies between the lateral head of the triceps and the outer or long head of the biceps. Both hammer curls and reverse curls hit the brachialis, but Sergi likes hammer curls with a dumbbell, as they allow for better emphasis on each arm independent of the other.



DUMBBELL CONCENTRATION CURL

The old standby for isolating a single biceps at a time is the seated concentration curl with a dumbbell. All types of lifters have relied on it for many decades to provide strict work for the biceps without any surrounding muscle groups like the delts taking over, and Sergi likes it for just that reason. "The name of the exercise says it all," he declares. "It truly does allow you to concentrate purely on the biceps."





ONE-ARM DUMBBELL PREACHER CURL

Because Sergi is careful to provide independent work for each arm, single-arm movements play a key role in his arm training. For his biceps, he likes both single-arm preacher curls with a dumbbell, as well as the seated concentration curl. Preacher curls have a special advantage as the working arm is braced on the pad, making cheating less likely and ensuring total isolation of the biceps.

CABLE PREACHER CURL

Another biceps movement Constance is a fan of is the preacher curl. Because of the sloped shape of the preacher bench and the limitations of free weights in the sense that gravity always pulls them down in a straight line to the center of the earth, Sergi prefers to do his preacher curls with a cable. This provides constant and even tension of the biceps throughout the entire range of motion from start to finish of the rep.



ARM WORKOUT ONE

BICEPS

Barbell curl (straight bar) 2 x 20 (warm-up)

4 x 15, 12, 10, 10

Single-arm dumbbell preacher curl 4 x 15, 12, 10, 10 + drop set

Dumbbell hammer curl 3 x 15, 12, 10

TRICEPS

Single-arm reverse grip cable pushdown 4 x 15, 12, 10, 10

Seated one-arm overhead dumbbell extension 4 x 15, 12, 10, 10 + drop set

Cable pushdown 3 x 20, 15, 10

Dumbbell kickback 3 x 15, 10, 10

TRICEPS

CABLE PUSHDOWN

Cables are even more of a factor in Sergi's triceps training. Even though he is still young and injury free, he wisely understands the importance of warming up the elbows thoroughly before any free weight extension movements. That's why his first movement on triceps days is always some form of cable pushdown to bring blood into the area and prepare it for the heavier work to follow.

In particular, he feels that the lateral head of his triceps (the part that gives the triceps "width" when you are facing forward) needs the most work, so he is sure to do plenty of extension movements such as skull-crushers and cable pushdowns. Sergi switches up his workouts on a regular basis. For periods of time he will train triceps either after chest or shoulders, and biceps will be hit after back. At other times, he will dedicate an entire training day to arms. "If anyone has lagging arm development and really wants to focus on them, this is what I would absolutely recommend they do," he says.

SERGI'S TWO ARM WORKOUTS

Sergi alternates between two different workouts for his arms. Workout One uses mostly free weights and features both movements where both arms are worked at the same time, and movements that work each arm individually to ensure that one side never dominates, thus maintaining a balance of both size and strength for the left and right arms. Workout One also happens to prioritize biceps by putting their exercises at the beginning of the workout.

Workout Two cranks up the intensity, generously incorporating supersets and stressing constant tension on the arms via the use of cables. Triceps get preferential treatment in this workout, being featured as the first movement in each superset.



EZ-BAR SKULL-CRUSHER

Skull-crushers are to triceps what barbell curls are to biceps, namely a must-do mass-building staple. Sergi brings an EZ-curl bar over to a flat bench and begins the set with his arms extended straight up to the ceiling. Slowly and with total control, he bends at the elbows and lowers the bar until it's just an inch over his forehead before smoothly reversing direction and extending his arms back to the start position.



ARM WORKOUT TWO

Superset 1 (4 rounds, adding weight each round)

Single-arm reverse grip cable pushdown 4 x 20, 15, 10, 10

EZ-bar curl 4 x 20, 15, 10, 10

Superset 2

EZ-bar skull-crusher 4 x 20, 15, 10, 10

Dumbbell hammer curl 4 x 10, 15, 10, 10

Superset 3

Overhead rope extensions 4 x 20, 15, 10, 10

4 x 20, 15, 10, 10

Superset 4

Dumbbell kickbacks 2 x 15

Dumbbell concentration curls 2 x 15



SEATED ONE-ARM OVERHEAD DUMBBELL EXTENSION

Overhead movements are mandatory for complete triceps development, as this is the only position that fully activates the long head, the meaty part of the tri's seen from the back. The seated dumbbell extension with one arm is a favorite of Sergi's, as he is always conscious of making sure both arms are being worked equally hard.

SERGI'S TOP 3 TIPS FOR BIGGER ARMS

1. CONTROL EVERY REP

"Focus on the contraction and squeeze the muscle hard on each and every rep. Always stay in control of the movement. Flex the biceps or triceps on the positive part of the rep, and control each negative so the muscle stretches on the way back down."

2. WORK EACH SIDE INDEPENDENTLY

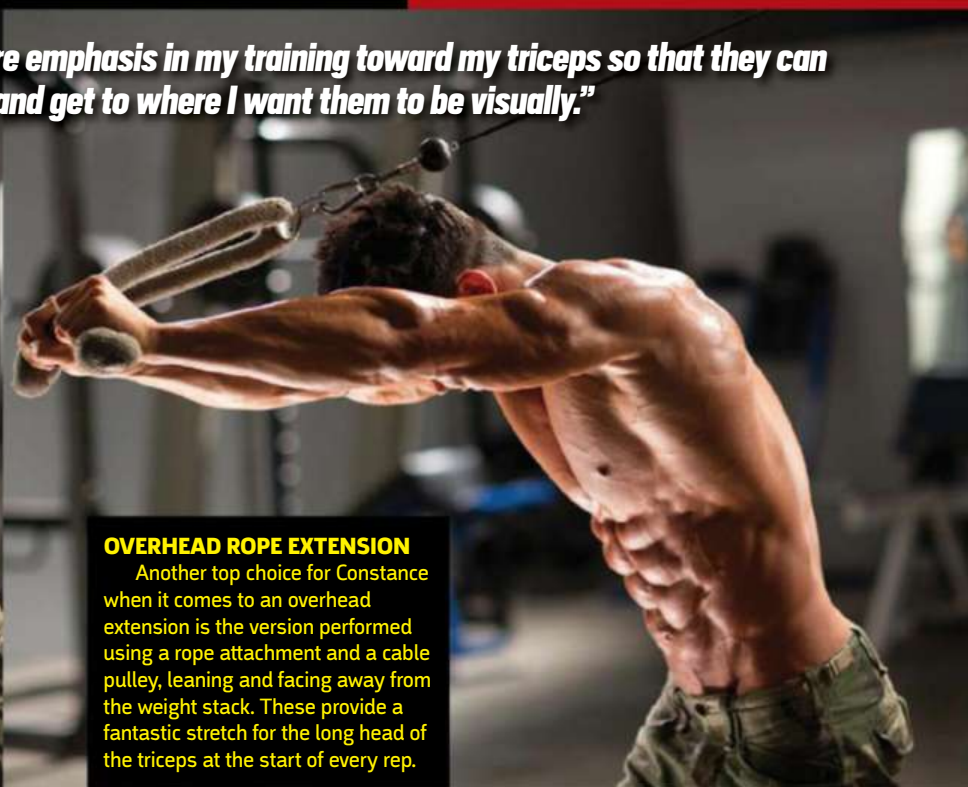
"You do want to do exercises using both arms at the same time, such as barbell movements, but you also need to make sure you include single-arm and alternating movements for both the biceps and triceps. Everybody has a dominant side of his body, and it will always have a tendency to take over and rob the other side of intended stress if you let it. Over time, this can lead to serious imbalances in the size and strength of your arms unless you take care to do movements that focus on one side at a time."

3. LOSE THE EGO!

"A few years ago, I used to train my arms much heavier than I do now. My arms were nowhere near the size and quality of development when I did that. Only once I realized that if I went lighter on the weights, did more reps and could actually squeeze the muscle on every rep did my arms start to really look good. There's just no way you can get the best results from arm training if you go too heavy and don't get that good pump and burn."



"I put more emphasis in my training toward my triceps so that they can catch up and get to where I want them to be visually."



OVERHEAD ROPE EXTENSION

Another top choice for Constance when it comes to an overhead extension is the version performed using a rope attachment and a cable pulley, leaning and facing away from the weight stack. These provide a fantastic stretch for the long head of the triceps at the start of every rep.



DUMBBELL KICKBACKS

One more single-arm movement Sergi relies on for his triceps training is the good old dumbbell kickback. He likes to do these braced on a flat bench, making sure the upper arm remains perpendicular to the ground at all times. A very common form error is to let the elbow drop down so it points toward the floor, effectively keeping tension off the triceps for most of the range of motion.



ONE-ARM REVERSE GRIP CABLE PUSHDOWN

Last but not least is one more single-arm movement for the triceps, a cable pushdown with a reverse grip so the palm faces upward. Just as the brachialis is a tougher-to-reach area that's critical for complete biceps development, the medial head of the triceps is also an oft-neglected area that can add extra beef to the tri's. Most of it is covered by the lateral and long heads, and only a reverse grip isolates it. This exercise is a perfect way to reach that medial head. Don't even think about going heavy, just focus on form and a solid squeeze.

DAILY DIET AND SUPPLEMENTS*

Upon waking:	1 scoop BCAAs, Glutamine, Carnitine 1 tab CLA 1 tab Pro Test 1 serving Pro Ripped
Meal 1:	2 whole eggs, 6 egg whites, 1 cup oats, blueberries and strawberries
Meal 2:	6 oz. chicken or turkey, 1 cup rice, asparagus
Pre-workout:	1 serving Pro Pump 1 serving Pro Test
During training:	BCAAs in water
Post-workout:	Immediately after: 1 serving BCAAs
20 minutes later:	1.5 scoops fast-digesting carbs, 1 scoop whey isolate
Meal 3:	7 oz. salmon, 7 oz. potatoes, asparagus
Meal 4:	7 oz. beef, 2.5 cups rice, 1 tab CLA
Meal 5:	6 oz. tuna, spinach salad with tomatoes and walnuts
Meal 6:	2 whole eggs, 6 egg whites, 1/3 cup oats, walnuts
Before bed:	2 tabs PM Recharge 1 scoop BCAAs, Glutamine, Carnitine

*All supplements by 1 Up Nutrition. Visit www.1UpNutrition.com.



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SPLIT-**VS.** FULL-BODY ROUTINES

***WHICH IS BEST FOR
MAXIMAL MUSCLE GROWTH?***

BY BRAD SCHOENFELD, PH.D., CSCS, FNSCA
PHOTOGRAPHY BY PER BERNAL

In the early days of bodybuilding, competitors routinely trained using full-body routines. Steve Reeves was a huge proponent of this style of programming. He worked all the major muscle groups during each session, training three non-consecutive days per week. He thought that frequently stimulating muscles throughout the week was the best way to pack on muscle without overtraining. A majority of the bodybuilders from this era, including Reg Park, Vince Gironda and John Grimek, also built their championship physiques using full-body routines; it was the norm rather than the exception.

By the 1960s, training philosophies began to change. Full-body routines gave way to training splits, where the goal is to blitz a muscle using multiple sets and exercises, and then afford the muscle with as much as a week's recovery before it's directly trained again.

Today, splits continue to rule the realm of bodybuilding. A recent survey of competitive bodybuilders found that every single respondent trained with a split routine.² Every one! Further, more than two-thirds of those interviewed reported training each muscle group only once per week, and none worked a given muscle more than twice weekly.



MORE TRAINING VOLUME PER MUSCLE GROUP

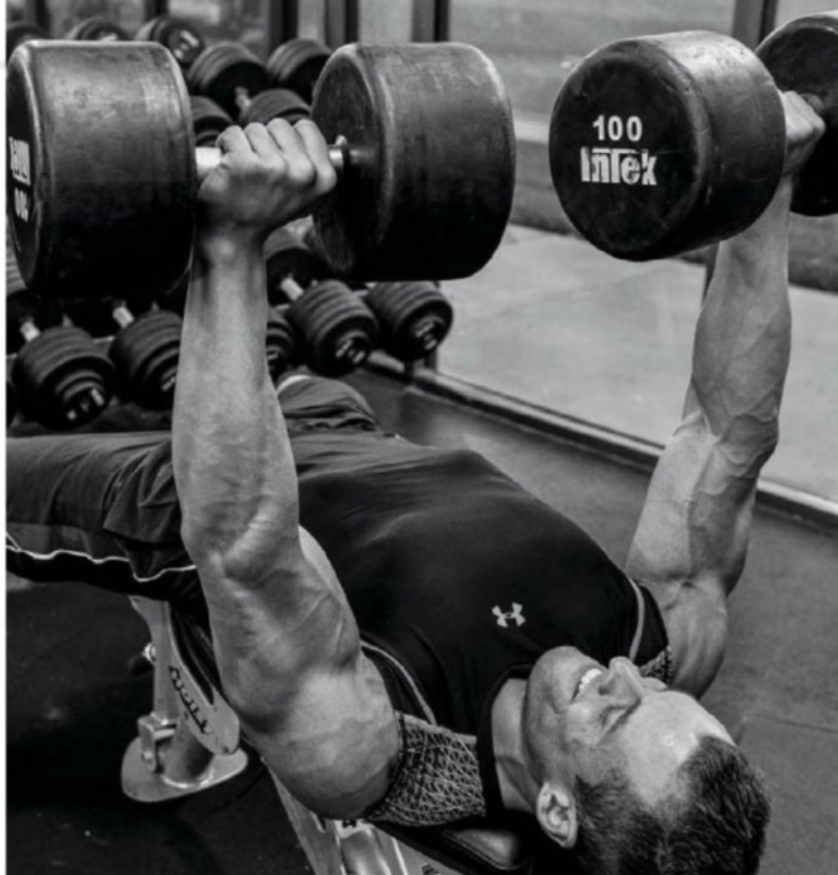
The theoretical benefit of a split routine is that it allows total weekly training volume per muscle group to be increased, while providing muscles greater recovery for growth.³ In addition, blasting a muscle with a high training volume in a given session heightens intramuscular metabolic stress¹, which in turn is believed to enhance the hypertrophic response.⁹ The combination of these factors are thought to ultimately lead to greater long-term muscular gains.

Although a case can be made for using either full- or split-body routines to build muscle, an evidence-based opinion can only be formed by first evaluating the results of controlled research. Given that training frequency is one of the most important training variables, you'd think there'd be a ton of studies conducted on the topic, right?

Wrong!

Until recently, only one study actually compared the muscle-building effects of training muscles one versus three days per week.⁷ Subjects either performed three sets per exercise in a single weekly session, or one set per exercise spread out over three weekly sessions for 12 weeks. At the completion of the study period, results showed

RESEARCH SHOWS A BENEFIT TO TRAINING MUSCLES FREQUENTLY THROUGHOUT THE COURSE OF A WEEK.





greater increases in lean body mass for the three-day-a-week group, indicating a benefit of training muscles more frequently. While the study is intriguing, there are some inherent limitations that hinder the ability to draw practical conclusions. For one, subjects performed only three sets per muscle group per week—far below what most serious exercisers typically include in their training programs. For another, muscle mass measures were assessed by the skinfold technique, which lacks precision in determining true changes in hypertrophy over time. The applicability of the study to serious lifters seeking to maximize muscle building is therefore limited.

'BRO SPLITS' VS. FULL-BODY ROUTINES

To gain clarity on the topic, my lab recently carried out a controlled study that compared muscular adaptations in a typical "bro split" versus a full-body routine in well-trained lifters.¹¹ Both routines comprised 21 different exercises that targeted the major muscle groups using multi-set routines. Those in the split routine performed chest and back on day one, lower body on day two and shoulders and arms on day three. Alternatively, the full-body routine consisted of performing one exercise for all the major muscle groups during each session. Training was carried out three days per week for eight weeks. Total volume was equated between routines so that any differences in muscle development could be attributed directly to the effects of training frequency. Changes in muscle size were assessed by ultrasound to provide direct hypertrophic measurements. Subjects were college-aged men with an average of more than four years of lifting experience, thus ruling out any issues from the "newbie effect."

The surprising results challenge current training practices.

Those performing the full-body routine experienced significantly greater increases in biceps growth compared to split-body training (6.5% versus 4.4%, respectively). Although differences in the other muscles analyzed were not statistically different, the increases favored the full-body routine for both the triceps (8.0 versus 5.0%, respectively) and the quads (6.7 versus 2.1%, respectively). Moreover, determination of effect size—a statistical gauge of the meaningfulness of results—showed a clear advantage for the full-body routine in all of the muscles we measured. These findings suggest a benefit to training a muscle more often over the course of a week.


TIME TO DITCH THE SPLIT?

So, what gives? Do all of today's competitive bodybuilders have it wrong? Should we revert back to old-school training practices?

There is a logical basis to training muscles more frequently each week. This is consistent with the fact that muscle size is regulated by the dynamic balance between muscle protein synthesis (MPS) and protein breakdown.¹⁰ Simply stated, when MPS is greater than breakdown, there is a net accumulation of skeletal muscle mass; the more you can maintain high levels of MPS over time, the greater your gains. Research shows that the time course of muscle protein synthesis (MPS) lasts about 48 hours or so following a lifting session.⁸ It's therefore reasonable to conclude that training a muscle every few days would keep MPS consistently elevated, and thus have a positive effect on muscular development.

Before you ditch the split, however, it's important to consider a couple of things. First and foremost is the novelty factor. Prior to training, we conducted pre-study interviews about training history. During these interviews, 16 of the 19 subjects reported regularly employing a split routine, with each muscle group trained once per week. Research indicates that simply changing program variables so that a new stimulus is provided can enhance muscular adaptations.⁴ This raises the possibility that those in the full-body training group benefited from the unaccustomed stimulus of training muscles with a greater weekly frequency.





DO ALL OF TODAY'S COMPETITIVE BODYBUILDERS HAVE IT WRONG? SHOULD WE REVERT BACK TO THE OLD-SCHOOL TRAINING PRACTICES OF STEVE REEVES AND COMPANY?

TRAIN MUSCLES MORE FREQUENTLY TO MAXIMIZE MUSCLE

Perhaps more importantly, the study needs to be taken in the context that volume was equated between groups. A primary benefit to training with a split routine is that it allows more volume to be packed into workouts over the course of a week. Assuming 48 hours is afforded between training a given muscle group—a generally accepted tenet—then full-body training limits you to three weekly sessions. Alternatively, splitting the routine lets you up the frequency of sessions per week, and thus allows you to achieve more volume per muscle, per session. Given that higher training volumes are strongly associated with greater muscle growth^{8,9}, the potential value of training splits should not be discounted.

Bottom line: Research shows a benefit to training muscles frequently throughout the course of a week. Although evidence is somewhat limited, it would appear that at least twice-weekly stimulation of a given muscle is beneficial to maximize growth.¹² This can be accomplished with an upper body/lower body split carried out four days per week (i.e., two days on/one day off, two days on/two days off) or a three-way split (i.e., push/pull/legs) performed six days per week (i.e., three days on/one day off). It's also possible that periodizing training frequencies might provide a means to maintain the novelty of the training stimulus. Accordingly, consider integrating full-body workouts into your programming over the course of a training cycle to enhance the hypertrophic response.

Brad Schoenfeld, Ph.D., CSCS, FNSCA, is widely regarded as one of the leading authorities on training for muscle development and fat loss. He has published over 60 peer-reviewed studies on various exercise- and nutrition-related topics. He is also the author of the best-selling book, *The M.A.X. Muscle Plan*, and runs a popular website and blog at www.lookgreatnaked.com.



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TURNING UP THE HEAT? OR COLD?

FOR MUSCLE STRENGTH & GROWTH

The standard response to speed up the recovery process after heavy weight training typically involves the application of either cold (cryotherapy) or heat (thermotherapy) to the sore muscle groups. Cryotherapy reduces the temperature of the contacted area, causing constriction of the blood vessels, or vasoconstriction—which reduces blood flow to the area. This, in turn, reduces the release of inflammatory cells to the site, minimizing overall inflammation, which can promote healing.

Thermotherapy, on the other hand, actually triggers a small amount of inflammation required to repair the exercised muscle by inducing vasodilation, thus increasing the flow of blood and certain immunological cells to the area. The increase in immune cells to the area facilitates muscle tissue repair by removing damaged cells and additional cellular debris. Because of the different influence that each therapeutic approach has on vascular and immune system function, they are both applied at different times relative to training, with cryotherapy usually applied right after exercise and thermotherapy applied at a later point in time.

Despite the different physiological response by the body to cold or heat therapy, along with the different temporal use

of each relative to the time of exercise, the scientific evidence shows that the use of either modality similarly reduces exercise-induced delayed onset muscle soreness (DOMS).^{1,2,3} This benefit makes the use of either seem like a good way to alleviate muscle soreness, and that it simply depends on which approach you prefer the most. However, if you're trying to maximize exercise performance, then you should certainly consider a few more recent studies showing that cold-based therapies appear to reduce the anabolic response to training^{4,5}, conceivably reducing the ability to pack on muscle mass, while the application of heat has been shown to increase activity of the muscle-building molecule mTOR—indicating that the preferential use of heat therapy instead of cold therapy will generate superior gains in size and strength.

CRYOTHERAPY FREEZES MUSCLE ANABOLISM

Resistance training induces muscle growth and strength by stimulating the release of certain anabolic hormones such as growth hormone (GH), insulin-like growth factor 1 (IGF-1) and testosterone. Growth hormone is a protein molecule that triggers several biochemical-signaling cascades that promote





The application of heat enhanced mTOR signaling, likely leading to a greater capacity to pack on muscle mass.

an anabolic environment. One of the primary ways that GH triggers muscle growth is by triggering the production of IGF-1, which produces muscle growth by increasing muscle cell protein synthesis. Testosterone boosts muscle growth by activating the androgen receptor, which also stimulates protein synthesis within muscle tissue, promoting muscle growth and strength.

Since several studies indicated that post-exercise cryotherapy decreased the adaptive response to resistance exercise as well as overall performance,^{4,6} A group of scientists from Israel wanted to see if this detrimental influence on performance was caused by decreased muscle growth in response cryotherapy.⁵ So, they investigated the effect of ice pack application on circulating levels of the key anabolic hormones GH, IGF-1 and testosterone. In order to do this, they had 12 highly trained male athletes perform several sprints on a treadmill at 80 percent of their maximum speed, followed by a rest period with or without the application of an ice pack on the trained leg muscles. Overall, this exercise protocol triggered the release of all three anabolic hormones, while the application of ice significantly reduced the level of each hormone. The results indicate that the use of cryotherapy after high-intensity training may hamper exercise performance to some degree, by inhibiting the anabolic process of muscle growth in response to the potent muscle-building hormones testosterone, GH and IGF-1.

TURN UP THE HEAT FOR GREATER MUSCLE GROWTH

Muscle hypertrophy is characterized by an increase in muscle protein mass that is primarily due to greater levels of muscle protein synthesis. While resistance training and nutrition are two very effective ways to trigger muscle growth, the application of heat stress has also been shown to potentially increase muscle protein synthesis and muscle mass^{7,8,9}, suggesting that thermotherapy would have a very similar effect. The theory supporting the influence of heat application on muscle growth begins with the notion that increased temperature triggers the production of a certain type of protein known as the heat shock protein (HSP), which play a critical role assisting the production of newly synthesized proteins in the cell. This effectively increases the level of protein synthesis within the muscle cell, ultimately promoting muscle growth. However, it has also been reported¹⁰ that increasing levels of the heat shock protein Hsp72 does not trigger muscle growth, indicating that enhanced muscle protein synthesis from heat stress is likely caused by a different molecular, or cellular, mechanism. Considering the central role of mTOR signaling in upregulating protein synthesis, scientists believed that heat stress-related muscle hypertrophy was likely caused by activation of mTOR.

In order to see if this was the case, a study by Kakigi et al.⁹ looked at the effect that heat had on mTOR activity in eight young, male subjects who performed several

sets of high-intensity knee extensions, either with or without the immediate post-exercise application of heat to the quadriceps muscle. Muscle biopsies of the quadriceps muscle showed a much greater level of mTOR activation in the muscle tissue that received the heat stress, indicating that the application of heat enhanced mTOR signaling, likely leading to a greater capacity to pack on muscle mass.

In summary, both cold or heat therapy similarly reduce muscle soreness—enhancing the recovery process and permitting a quicker return to training that will certainly support greater gains and performance over the long term. However, the application of cryotherapy post-workout appears to have one significant drawback relative to thermotherapy. That shortcoming being the capacity to lower levels of very important anabolic hormones, which will most definitely hinder the ability to increase muscle mass and strength. On the other hand, the use of thermotherapy, by itself or in combination with resistance training, enhances the rate of muscle protein synthesis, ultimately improving the ability to pack on muscle.

For most of Michael Rudolph's career he has been engrossed in the exercise world as either an athlete (he played college football at Hofstra University), personal trainer or as a research scientist (he earned a B.Sc. in Exercise Science at Hofstra University and a Ph.D. in Biochemistry and Molecular Biology from Stony Brook University). After earning his Ph.D., Michael investigated the molecular biology of exercise as a fellow at Harvard Medical School and Columbia University for over eight years. That research contributed seminal to understanding the function of the incredibly important cellular energy sensor AMPK—leading to numerous publications in peer-reviewed journals including the journal Nature. Michael is currently a scientist working at the New York Structural Biology Center doing contract work for the Department of Defense on a project involving national security.

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APS PRESENTS:

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During my time in the industry, I have reviewed more products than I can even count. Yes, I know that all the supplement junkies out there are burning with envy just reading this. I have been asked thousands upon thousands of questions from readers all over the world. One that I get asked over and over is what would be a basic but effective stack to help build muscle and burn fat at the same time. Well, this month I am going to introduce to you a stack that is far from basic, but packs a punch that Mike Tyson would be jealous of. This is no other than the Shred and Slam stack from **Advanced Performance Supplements (APS)**. It is comprised of three amazing formulations: their flagship protein formula, Isomorph 28, their pre-workout sensation, Mesomorph and their fat-burning incinerator known as Phenadrine.

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JUST BEET IT FOR IMPROVED PERFORMANCE

In the back of the produce section, hidden behind sections of beautiful bright, shiny vegetables, in an array of eye-popping Crayola-crayon colors, there's an unassuming, misshapen dusty-looking vegetable that can catapult your training and support heart and artery health at the same time. Consider beets nature's perfect heart-friendly food wrapped up in one sweet—though unusual looking—package.

Beets are special because they contain more nitrates than their neighbors in the produce aisle—green leafy vegetables including spinach, kale and celery. When you eat nitrate-rich foods, the bacteria on your tongue convert about 20 percent of dietary nitrate to nitrite, which enters the bloodstream where it is converted to a small signaling molecule called nitric oxide. Nitric oxide controls blood flow and many metabolic processes. Increased nitric oxide production causes blood vessels to expand, increasing blood flow to working muscles. Think of your blood vessels like a garden hose. If you can open that hose even wider, more water will flow through it. In terms of blood vessel expansion, “the increase in blood flow improves the delivery of oxygen and nutrients to active muscles, and the removal of metabolic byproducts that can interfere with muscle contraction and have an adverse effect on performance. In addition to improving the delivery of glucose to the muscles through better blood flow, nitric oxide also increases glucose (sugar) uptake by the muscle cell,” states John Ivy, Ph.D., Professor Emeritus, Department of Kinesiology and Health Education, College of Education at The University of Texas at Austin. Blood glucose is a major source of fuel for working muscles.

But the benefits of nitric oxide don't stop there. It also expands airways, making breathing easier. In addition, our cells become more efficient at producing ATP, the fastest source of energy for muscle contraction. Greater ATP production

translates to improved speed and explosive power. “Nutrients that we take in through our diet such as carbohydrates and fats are broken down and the energy released from the breakdown of these fuels is used to make ATP in the presences of oxygen. As nitric oxide levels increase, less oxygen is required to produce ATP, reducing the oxygen cost of exercise,” says Ivy. And therefore, along with greater ATP production, less energy is required to sustain the same level of effort while you are working out. And finally, nitric oxide may improve recovery between training sessions and allow you to exercise at a higher intensity before fatigue sets in.

GO RED FOR HEART HEALTH

Dietary nitrates from beetroot juice and green leafy vegetables have other, more profound, benefits for your body aside from affecting your training and sports performance. Consistent intake can help lower blood pressure and improve blood vessel functioning. Research also shows dietary nitrates may improve artery health by decreasing inflammation, platelets clumping together (a step in the formation of blood clots) and artery stiffness (stiff arteries do not easily expand to accommodate increases in blood flow, which may occur when blood pressure increases). With aging we aren't able to produce as much nitric oxide, which may make regular consumption of nitrate-rich foods even more important to support nitric oxide levels in the body.

**CONSIDER BEETS
NATURE'S PERFECT
HEART-FRIENDLY FOOD
WRAPPED UP IN ONE
SWEET—THOUGH
UNUSUAL LOOKING—
PACKAGE.**

DON'T CONFUSE BEETS WITH SIMILAR SOUNDING COMPOUNDS

Though beets and therefore beetroot juice are nitric oxide boosters, you won't want to confuse them with another nitric oxide booster—L-arginine. Beets and other nitrate-rich vegetables work through the nitrate-nitrite-NO pathway—one that functions when oxygen isn't as readily available and therefore when you are sucking wind during a fitness class or doing intervals while spinning. L-arginine works through a very different nitric oxide boosting pathway, one that requires the presence of enzymes and oxygen and therefore isn't effective when you are exercising at a very high intensity.

Beets and other vegetables rich in dietary inorganic nitrate are also not the same as nitrite salts (typically sold over the Internet), which can be harmful, even deadly in low doses. Also, organic nitrates and nitrites are totally different than the inorganic nitrates found in beets and green leafy vegetables. Organic nitrates and nitrites are potent vasodilators (substances that open blood vessels) found in the drugs nitroglycerin and amyl nitrite and should only be prescribed and used under the care of a medical doctor.



HOW MUCH IS ENOUGH?

Research studies show 16 ounces of beetroot juice (equivalent to approximately 300-500 mg nitrate) consumed daily, three hours before exercise, for a period of several days will effectively increase your body's production of nitric oxide so you notice a benefit while training. According to a few research studies, single doses of beetroot juice won't make a dent in your training.

If you are loading up on beets, keep in mind that you need the bacteria in your mouth to convert nitrates to nitrites, the very first step in nitric oxide production. If you use antibacterial mouthwash or antibiotics, you'll kill both bad bacteria and good bacteria and therefore make significantly less nitrite. Of course, you shouldn't stop using a prescribed antibiotic without your physician's consent, but antibacterial mouthwash might be optional, so talk to your dentist.

Keep in mind that the amount of dietary nitrate intake varies in beets (as well as other vegetables) based on growing conditions, including the nitrate content of fertilizer used, the level of nitrate in the water supply, soil conditions, time of year and how the vegetables are stored. "There are commercial products on the market that are made from different vegetables that claim to have high nitrate, but they aren't. Consumers need to do their homework if they are looking for a commercial source of dietary nitrate," says Ivy.

Though vegetables rich in nitrates are considered safe for healthy individuals, they may turn your urine and stools red (don't worry, this is harmless). However, people with pre-existing cardiovascular disease should of course tell their cardiologist about any dietary changes they plan to make, since certain foods can interact with specific prescription drugs. For instance, while green leafy vegetables are rich in good nutrition and contain nitrates that are important for cardiovascular health, they contain a good amount of vitamin K, a nutrient that can interfere with some blood-thinning medications.

You can't go wrong by picking up those oddly shaped red, yellow and orange bulb-looking veggies tucked away in back of your produce aisle. Beets are a good source of the B vitamin folate and contain more dietary nitrates than any other vegetable. When consumed regularly they may improve your training and also support cardiovascular health.

BEETS: DELICIOUS ANY WAY YOU SLICE THEM!

Beets are a very versatile food—their sweet, earthy flavor blends well with a variety of foods and they can be enjoyed raw (shred the pulp and add it to a salad), roasted, sautéed, braised (i.e. boiled), pickled and juiced.

Beets will stain your hands and anything else they touch. So either use disposable kitchen gloves when you're handling them or just be aware the palms of your hands will be stained red. Washing your hands right away will of course minimize some of the staining but definitely won't wash it all off.

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ROASTED BEET SALAD

MAKES 3 SERVINGS

The sweet tastes of beets blends well with the peppery bite of arugula.

Ingredients:

6 beets (any color)
Arugula, approximately 4-6 cups
2 Tbsp. aged balsamic vinegar
2 Tbsp. extra virgin olive oil
Feta cheese

Directions:

Preheat oven to 400 degrees. Slice off the tops and bottoms of the beets and discard. Peel the skin off with a vegetable peeler. Cut beets in 1- to 1.5-inch chunks. Place beets in a bowl and toss with olive oil to lightly coat. Cover a baking sheet with foil and place cut beets on the foil-lined sheet. Roast for 35 to 40 minutes, turning over twice so they cook evenly and are tender throughout. Remove from oven and let cool. Place arugula on each plate and top with beets. Sprinkle aged balsamic vinegar onto beets and top with feta cheese.



BEET ORANGE JUICE

MAKES 2 SERVINGS

Ingredients:

2 beets
3 navel oranges
Ginger if desired

Equipment:

Blender or food processor
Fine mesh strainer or cheesecloth
Vegetable peeler
Knife
Pancake flipper or spatula

Directions:

Slice off the tops and bottoms of the beets and discard. Peel the skin off with a vegetable peeler. Cut beets into quarters or slices if you have a heavy-duty blender (Vitamix or Blendtec for example). Otherwise, dice beets (they are hard, so make sure your blender or food processor can handle them). Peel oranges and place in blender or food processor with diced or cut beets on top. If you are incorporating ginger into your shake, peel it, cut it and place on top of beets. Blend or process until liquefied. Place a cheesecloth or fine mesh strainer over a bowl and pour the juice over it. Push remaining pulp on top of the cheesecloth or strainer down with the back of a pancake flipper or spatula to get as much juice as possible into the bowl. Discard the remaining pulp and pour your juice into a glass over ice and enjoy!



MIRACLE **POWERS** OF CAPSAICIN

The phytochemical capsaicin is the substance found in chili peppers that contributes to the hot and spicy flavor of the chili pepper. This miraculous compound has the unique capacity to promote a wide range of positive effects on human health, including reduced body fat, powerful antioxidant and anti-inflammatory effects and improved cardiovascular health, just to name a few. In fact, a recent epidemiological study investigating almost half a million people showed that the habitual consumption of chili-rich foods, loaded with capsaicin, reduced the likelihood of death from certain chronic diseases such as cancer and heart disease, relative to those who did not consume chili-rich, spicy foods.¹

In addition to capsaicin activating the TRPV1 receptor in certain neurons found within the gastrointestinal tract, triggering a process known as thermogenesis that burns body fat, capsaicin also produces many additional health benefits by activating the same TRPV1 receptor, yet in other tissues throughout the body. Activation of TRPV1 within these tissues triggers the function of different protein molecules, resulting in unique effects that are tissue-specific.

INCINERATE BODY FAT

One of the more influential TRPV1-dependent effects from capsaicin intake is the activation of TRPV1-expressing neurons within the oral cavity and gastrointestinal tract, which ultimately increases the amount of energy expenditure in brown adipose tissue (BAT) by a process known as thermogenesis.² Although the mechanism of action is not completely understood, some of

the details include capsaicin activation of the TRPV1 receptor within the oral cavity and gastrointestinal tract, which triggers the release of noradrenaline. The release of noradrenaline then stimulates the process of thermogenic fatty acid oxidation within BAT, which has the unique capacity of uncoupling the normally linked process of fatty acid oxidation with cellular energy production in the form of ATP. Consequently, the energy is instead directly converted into heat, which effectively increases energy expenditure.

Several studies looking at the impact

of capsaicin on metabolic rate have shown that capsaicin does enhance energy expenditure while boosting fat oxidation, promoting significant weight loss.^{3,4} It has also been shown that the positive influence of capsaicin on thermogenesis is greatest in those people with the most BAT⁵, and there is some evidence indicating that sustained intake of capsaicin can increase BAT levels in humans⁶ — meaning that long-term capsaicin intake could boost BAT levels, improving the capacity to thermogenically burn body fat.

CURB YOUR APPETITE

The consumption of capsaicin can also reduce appetite and food intake², further supporting the ability to lose weight— and, perhaps more importantly, keep it off for good. Although the appetite-suppressing effect of capsaicin has been observed in several trials, it is not entirely understood how capsaicin reduces appetite. That said, some details have been uncovered with the release of noradrenaline triggered by capsaicin, as previously mentioned, appearing to contribute to the reduction in appetite— as the stimulation of the noradrenaline receptors in the brain has been shown to produce feelings of satiety.⁷ In addition, capsaicin intake has also been shown to cause an increase in the gut-derived hormone glp-1, which turns on regions of the brain that diminish food intake by reducing hunger.⁸ Moreover, this effect appears to be TRPV1-dependent, as the hunger-reducing impact of capsaicin was absent in mice that were genetically altered so they could not produce the TRPV1 receptor in gastrointestinal cells.

Overall, studies have shown



LONG-TERM CAPSAICIN INTAKE COULD BOOST BAT LEVELS, IMPROVING THE CAPACITY TO THERMOGENICALLY BURN BODY FAT.

that the consumption of capsaicin does decrease hunger³, as capsaicin-treated subjects typically report a reduced desire to eat while also achieving greater satiety after meals.

IMPROVE CARDIOVASCULAR HEALTH

Research has also demonstrated that capsaicin can improve cardiovascular health by decreasing cholesterol levels while simultaneously triggering systemic vasodilation, which altogether improves blood flow—supporting superior cardiovascular health.

Capsaicin lowers cholesterol levels in the blood in two different ways. The first approach is TVPV1-independent, where capsaicin intake increases the production of bile acids—which have the unique capacity to interact with and clear cholesterol from the blood, effectively lowering cholesterol levels.⁹ It has also been shown that capsaicin activation of the TRPV1 receptor in smooth muscle cells lining the arterial wall significantly reduced the accumulation of cholesterol and other lipids within the arteries by increasing cholesterol efflux out of these cells, while also reducing cholesterol uptake into these cells.¹⁰ In fact, in mice models prone to getting plaque buildup within the arteries, dietary capsaicin was shown to slow down the accumulation of plaque within the arteries.¹¹

In addition to its capacity to reduce cholesterol, dietary intake of capsaicin also increases the expression and activity of the enzyme nitric oxide synthase¹², resulting in an increase in levels of the signaling molecule nitric oxide (NO)—which then stimulated vasodilation, and blood flow, in mice.¹³ Furthermore, the use of capsaicin patches in humans with



CAPSAICIN-TREATED SUBJECTS TYPICALLY REPORT A REDUCED DESIRE TO EAT WHILE ALSO ACHIEVING GREATER SATIETY AFTER MEALS.

mild coronary artery disease showed better cardiovascular function while exercising, compared to when the same subjects received the placebo patch with no capsaicin.¹⁴ Interestingly, use of the capsaicin patch during this study increased serum NO, which improved blood flow to the working muscles and heart for improved overall exercise performance.

ANTIOXIDANT AND ANTI-INFLAMMATORY EFFECTS REDUCE DISEASE

Another positive impact that capsaicin has on overall health is its exceptional capacity to uncouple the normal metabolic process of macronutrient oxidation with energy production throughout the body. While this capability can be used to increase energy expenditure by thermogenesis in BAT, in other tissues such as the liver and heart, the uncoupling of energy production to the oxidation of fats and carbohydrates can improve health by reducing the production of superoxide free radicals that are normally produced by this process. This is partic-

ularly the case when oxidation rates are very high, overwhelming the oxidative machinery within the cell and ultimately resulting in greater levels of superoxide free radical production.^{15,16}

Reduction of superoxide free radical production within the above-mentioned tissues diminishes the amount of free radical damage to essential biomolecules that are required for normal cellular function, such as DNA. Free radical damage causes essential biomolecules to malfunction, which promotes the disease state. The accumulation of oxidative damage from these superoxide free radicals also stimulates a devastating immune response that leads to

chronic inflammation, further promoting the disease state.^{17,18} Consequently, the ability of capsaicin to extinguish free radical damage diminishes oxidative damage to key biomolecules, reducing long-term inflammation and thus the development of chronic disease—demonstrating one more way that this miraculous compound supports better health and well-being. ■

For most of Michael Rudolph's career he has been engrossed in the exercise world as either an athlete (he played college football at Hofstra University), personal trainer or as a research scientist (he earned a B.Sc. in Exercise Science at Hofstra University and a Ph.D. in Biochemistry and Molecular Biology from Stony Brook University). After earning his Ph.D., Michael investigated the molecular biology of exercise as a fellow at Harvard Medical School and Columbia University for over eight years. That research contributed seminally to understanding the function of the incredibly important cellular energy sensor AMPK—leading to numerous publications in peer-reviewed journals including the journal *Nature*. Michael is currently a scientist working at the New York Structural Biology Center doing contract work for the Department of Defense on a project involving national security.

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METABOLIC FINISHER CIRCUIT

WITH BATTLING ROPES

Part of training smart is using the best tool for the right job. And, when it comes to maximizing muscle building to improve the shape of your body, nothing beats resistance training. But when it comes to maximizing the metabolic demand, a 2013 study published in the *Journal of Strength and Conditioning Research* has shown that the performance of exercises with battling ropes elicit relatively higher acute metabolic demands than traditional resistance exercises performed with moderately heavy loading.¹

The idea behind using the battling ropes circuit featured in this article as a “metabolic finisher”—after you’ve done your strength training—is simple: Use a quick burst of energy at the end of a workout to increase your heart rate and burn more calories. This way you get to reap the unique benefits both types of exercise (resistance training and battling ropes) offer in order to make your workouts more comprehensive, diverse and interesting. Not to mention, metabolic battling ropes exercises and sequences such as what’s provided for you here are great for improving your upper body power-endurance (aka conditioning), which is the capacity to produce the same level of power for a longer time—the length of competition. This is especially important to keep your workouts balanced since so much of conditioning (power-endurance training) is lower body dominant (e.g., sprints, hills runs, stairs, etc.).

METABOLIC BATTLING ROPES CIRCUIT

Although battling ropes exercises are most commonly performed using both hands, which is still very effective, another 2013 study also published in the *Journal of Strength and Conditioning Research* found that one-arm versions of the battling ropes exercises were more stressful than using two arms. This same research also demonstrated that the battling rope exercise poses a significant cardiovascular and metabolic stimulus, with the effects made greater with using one-minute rest intervals compared to two minutes.

With this evidence in mind, the following battling ropes circuit involves performing four different single-arm exercises for 30 seconds on each arm. Once each side has been completed, you’ll rest one minute before moving on to the next exercise, and so on. Perform one full round as a metabolic finisher, which takes a total of seven minutes time to complete.

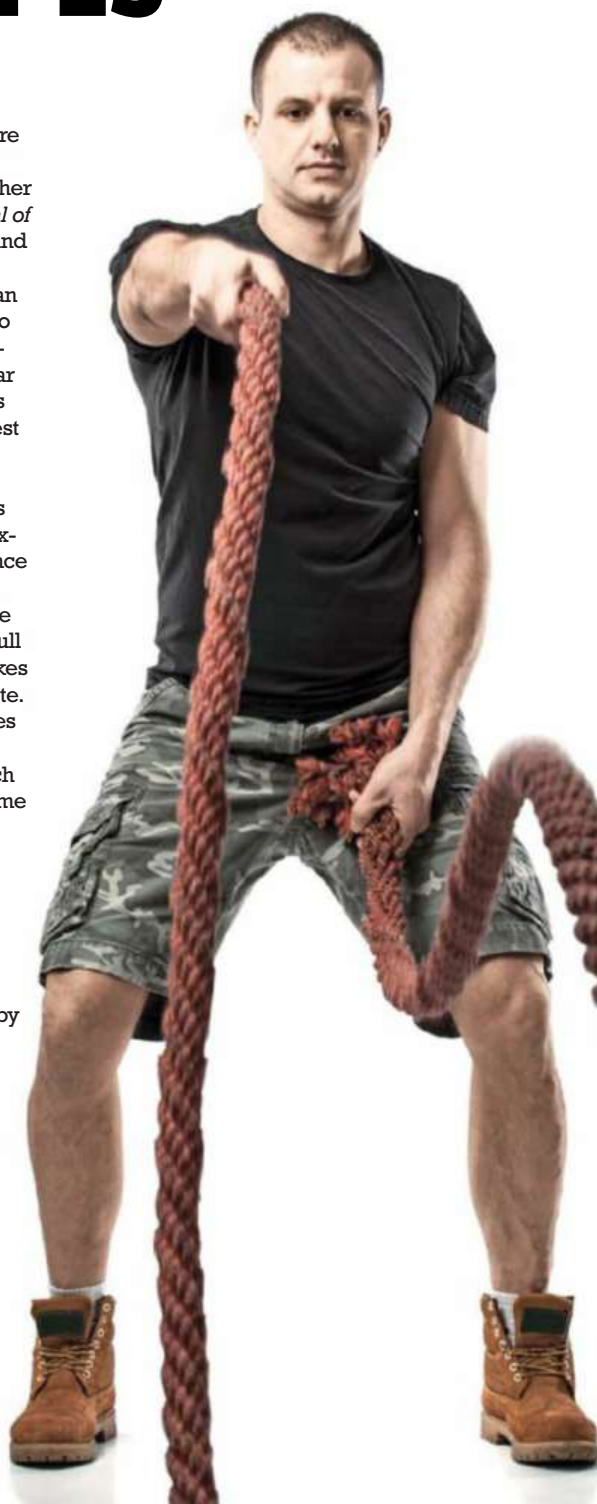
You can perform these four exercises in any order you’d like. Just make sure you perform as many repetitions of each exercise as you can in the 30-second time frame.

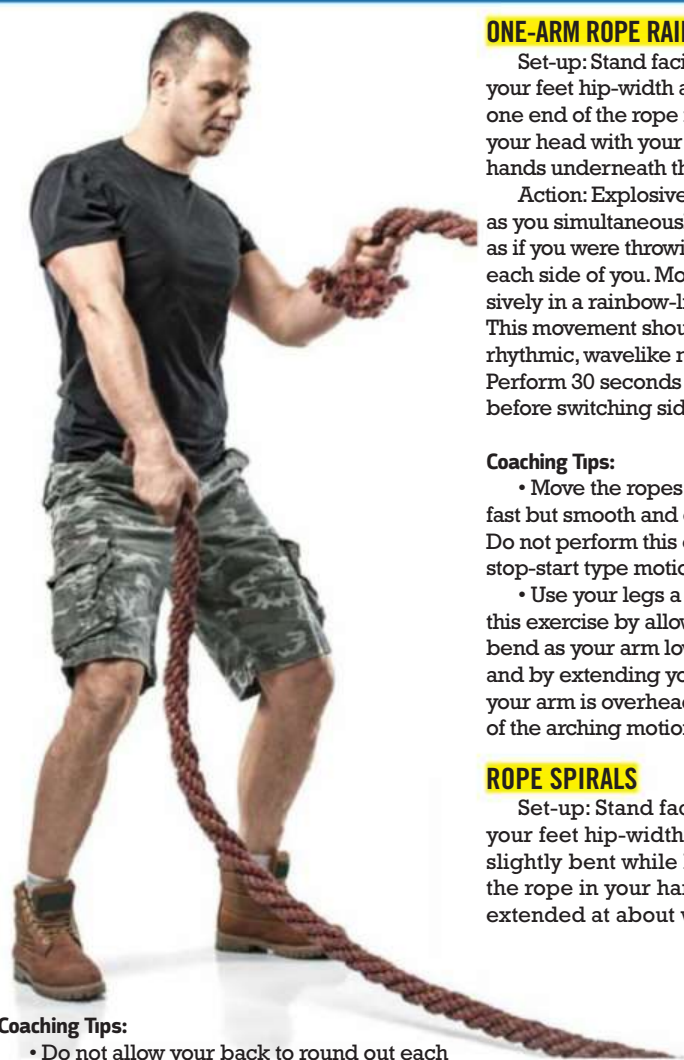
To perform the following exercises, you’ll anchor a set of battling ropes approximately 15-20 feet away around a stable object. Anchor the free end of the rope—the end you’re not going to be holding to perform the following single-arm battling ropes exercises—by wrapping it around the object you’re using as the anchor.

ONE-ARM TIDAL WAVES

Set-up: Stand facing the rope with your feet hip-width apart, knees slightly bent while holding one end of the rope in one hand with your arm extended at your side.

Action: Start swinging your arm up and down at the same time to create a parallel wavelike motion with the rope. Extend your legs each time you lift your arm slightly overhead, and allow your knees to bend each time your arm comes down. Perform 30 seconds on the same side before switching sides.





ONE-ARM ROPE RAINBOWS

Set-up: Stand facing the rope with your feet hip-width apart while holding one end of the rope in each hand above your head with your elbows bent and hands underneath the rope.

Action: Explosively pivot your body as you simultaneously flip the rope over as if you were throwing it to the floor on each side of you. Move your arm explosively in a rainbow-like, arching motion. This movement should also create a rhythmic, wavelike motion with the rope. Perform 30 seconds on the same side before switching sides.

Coaching Tips:

- Move the ropes back and forth in a fast but smooth and coordinated fashion. Do not perform this exercise in a jerking, stop-start type motion.
- Use your legs a bit as you perform this exercise by allowing your knees to bend as your arm lowers to each side, and by extending your legs each time your arm is overhead between each end of the arching motion.

ROPE SPIRALS

Set-up: Stand facing the rope with your feet hip-width apart, knees slightly bent while holding one end of the rope in your hand with your arm extended at about waist height.

Action: Keeping your elbow slightly bent, make an outward circular motion by moving your arm from your knees to above your head, creating a spiral pattern. Repeat this motion as fast as you can. Perform 30 seconds on the same side before switching sides.

Coaching Tips:

- Maintain an athletic, ready stance throughout this exercise.
- Don't just use your arm. Allow your entire body to contribute to rapidly moving the ropes. ■

Nick Tumminello is the owner of Performance University in Fort Lauderdale, Florida. He's also the author of the book Strength Training for Fat Loss and the DVD by the same name. For more information visit NickTumminello.com.

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Coaching Tips:

- Do not allow your back to round out each time you slam the ropes down toward the floor.
- Don't just use your arm. Allow your entire body to contribute to rapidly moving the ropes.
- Move as fast as possible, without pausing at any point until the set is completed.

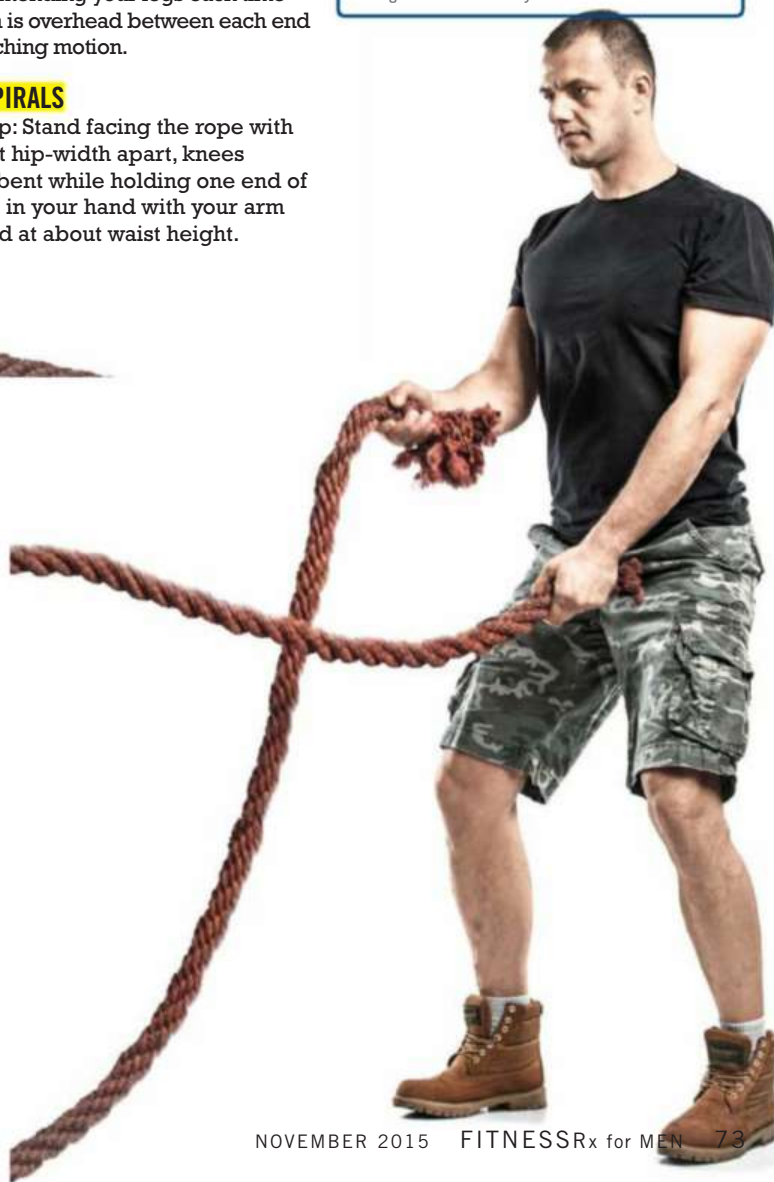
ONE-ARM SMALL WAVES

Set-up: Stand facing the rope with your feet hip-width apart, knees slightly bent while holding one end of the rope in your hand with your arm extended out in front of you at roughly waist height.

Action: Keeping your elbow slightly bent, rapidly raise your arm to shoulder level, then, as quickly as you can, lower it back down toward the floor. Continue whipping the ropes up and down as fast as you can. Perform 30 seconds on the same side before switching sides.

Coaching Tips:

- Maintain an athletic, ready stance throughout this exercise.
- You'll make shorter, quicker waves in this exercise than in the rope tidal waves.



COMPLETE CORE TRAINING

Although just about everyone who's interested in training uses the term "core," most are unaware that the term was first coined in 1982 to describe the muscles that comprise the center of the body and control the head, neck, ribs, spine and pelvis.¹ In other words, your core isn't just your abs and lower back; your core is made up of all of the muscles of your torso, including your glutes, lower back, mid-back, lats, shoulders and chest, along with your abs and obliques.

Now that we've clarified the confusion on what term core means, a recent study found that an isometric training approach was superior in terms of enhancing core stiffness, which has led some people, including many fitness professionals, into thinking that isometric exercises like planks, side planks and anti-rotation presses provide a complete core training stimulus.² It's certainly true that enhanced core stiffness allows the spine to bear greater loads³ and to better *transfer force between the hips and the shoulders*.⁴ However, it's only half of the core training puzzle because the torso musculature doesn't just transfer force by limiting its movement, it also helps to produce force through dynamic movement.

This reality is perfectly summarized by the researchers in a 2012 study published in the *Journal of Strength & Conditioning Research*, which stated, "Core strength does have a significant effect on an athlete's ability to create and *transfer* to the extremities."⁵

THE DYNAMIC CORE

Put simply, just by looking at athletes in action, one cannot deny the obvious active, movement role in power production (i.e., force summation) the trunk has in sporting actions like throwing, golfing, batting, punching, etc.

In the loading phase (before the exploding phase) of a tennis serve, a soccer throw, throwing a football and swinging a golf club, there's movement of the trunk, which creates eccentric lengthening (in various planes of motion), so the torso musculature can actively contribute, along with the legs and arms, to produce power.

ATHLETIC POWER AND THE CORE

It's often said that power comes from the summation of force. But it's your levers (i.e., your joints, which are controlled by muscles and connective tissues) that produce the force. So, producing power is really about sum-



mating your levers in a coordinated and synchronized fashion to produce maximal force.

Keep in mind that your spine is one big series of levers—each segment is a small lever. With these realities in mind, you can appreciate the trunk's contribution to power production in sporting actions like throwing a ball and swinging a golf club or tennis racquet.

You can also appreciate the active contribution the torso has in power production by trying this simple experiment: First, perform an overhead soccer medicine ball throw (use a medicine ball that's approximately four to six pounds) in the normal fashion (as it's performed in athletics) where you extend at your spine and hips a bit (I didn't say go to end range) in order to allow your (anterior) torso musculature to eccentrically load. Then, compare that to an anti-extension soccer style throw where you don't allow your spine to move at all. You already know which of the two throws will be more powerful, not to mention, which throw will feel more natural and athletic.

What we're really talking about here is heavily related to the "serape effect," which Logan and McKinney discussed in their 1970 book *Anatomic Kinesiology*.⁶ So, although identifying that the torso doesn't just transfer force and reduce force by limiting movement but also helps to produce force by contributing to many foundational movements to athletics is nothing new; it's the dynamic movement aspect that seems to be the most misunderstood, and therefore an often neglected aspect of a complete core-training program.



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HARD CORE TRAINING

COMPLETE CORE TRAINING

Now that we've established that in addition to its respiratory function, the trunk (i.e., core) muscles do two things in athletics (and in general function)—transfer force through limiting movement and help to produce force by creating movement—we can talk about using core-training exercise applications that will likely transfer into improving both aspects of core performance.

A simple way to ensure you have a fully comprehensive core-training routine is to hit each of three aspects described in the chart below using both isometric and dynamic exercise applications.

	ISOMETRIC EXERCISE	DYNAMIC EXERCISE
Anterior (front) core	Arm Walk-Out	Stability Ball Pike Roll-out
Lateral core	One-Arm Dumbbell Farmer's Walk	Medicine Ball Rainbow Slam
Rotational core	Cable or Band Anti-Rotation Press	Medicine Ball Side Scoop Horizontal Throw

You don't need to use all of these exercises in the same training session, but rather use two or three different ones in each workout you do throughout the week.

MEDICINE BALL SIDE SCOOP HORIZONTAL THROW

Stand perpendicular to a solid wall at your right side with your feet shoulder-width apart and your knees slightly bent. Hold the (3-5 kg) medicine ball—I recommend using a Dynamax-style medicine ball—by your left hip and shift your weight to your left leg while slightly hinging forward at your hips. Explosively shift your hips toward your right while simultaneously turning your hips and shoulders to throw the ball horizontally, using both hands in a scoop-like motion. Perform three to four sets of six to eight reps on each side.

MEDICINE BALL RAINBOW SLAM

Stand with your feet hip-width apart and knees bent slightly while holding a (2-4 kg) medicine ball with both hands just outside your hip. Your weight is shifted slightly to the same side as you're holding the ball on. Drive your arms away from your hip and around your head in a rainbow style arc, slamming the ball on the ground at a roughly a 45-degree angle just outside your opposite foot while shifting your weight to the side. Allow the ball to bounce once before you catch it and rest for the next repetition. Perform two to three sets of six to eight reps on each side.

STABILITY BALL PIKE ROLL-OUT

This exercise combines the ball pike and the ball roll-out into one comprehensive abdominal exercise. Hold yourself in a push-up position with your hands directly underneath your shoulders and feet hip-width apart on a stability ball that's between 55 and 65 centimeters in size. With your body in a plank position, keep your legs straight and push your hips toward the ceiling while keeping your back fairly flat. After straightening your hips and coming back to the start position, push your body backward on the ball until your arms are fully extended in front of you and your legs are fully extended behind you. Reverse the motion and repeat. Perform three to four sets of six to 10 reps on each side.

CABLE OR BAND ANTI-ROTATION PRESS

Stand perpendicular to a cable handle or band that's attached at shoulder height to a stable structure or inside a doorjamb (many resistance bands come with an attachment for this). Hold both handles with both hands at the center of your chest with your feet roughly shoulder-width apart and your knees slightly bent. Reach your arms straight out in front of you at shoulder height without allowing your torso to rotate toward the cable or bands origin. Then slowly reverse the action and bring your hands back into the center of your chest. Perform two to three sets of eight to 12 reps on each side.

ONE-ARM DUMBBELL FARMER'S WALK

Stand tall holding a heavy dumbbell on the right side of your body by your right hip. Walk up and down the length of a room, keeping the dumbbell by your hip and maintaining your strong, upright posture. Then switch hands and repeat by holding a dumbbell on the other side. Perform two to three sets of 40 to 60 seconds on each side.

ARM WALK-OUT

Assume a kneeling position with your hands on the floor and your arms straight. You may also need to place a pad, pillow or folded towel under your knees for comfort. Walk your arms out in front of you as far as possible without allowing your lower back to extend beyond the starting position. Reverse the motion, walking your hands back so your hands end up just in front of your shoulders. Perform three to four sets of four to seven reps on each side. ■

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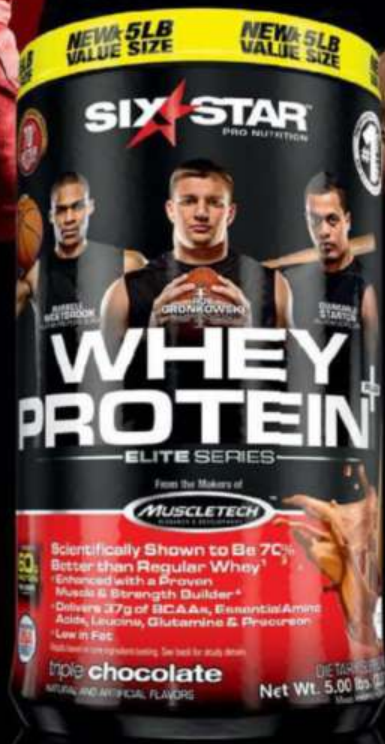
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CARVE DENSITY INTO YOUR INNER AND MIDDLE CHEST WITH CABLE CROSSOVERS

With winter coming on, and the Thanksgiving protein consumption coming up soon, who really spends much time thinking about carving a perfect chest? The bleakness of late fall and early winter just seems to invite a justification for eating more than we should and exercising just a little bit less than we need. Furthermore, with the onset of the cooler months, the thicker clothes come out of the closet, and it is pretty easy to cover up the torso, so the conditioning and hardness that we build in the summer can begin to fade just a bit.

However, this does not have to happen. Incorporating the cable crossover into your chest routine will light a fire around your torso, and each contraction will feel much like you are carving off the soft areas and leaving only slices of granite-hard pectoralis density with each repetition. However, if you engage in cable crossovers, you should be prepared for a chest roasting burn that you likely have not felt in a very long time.

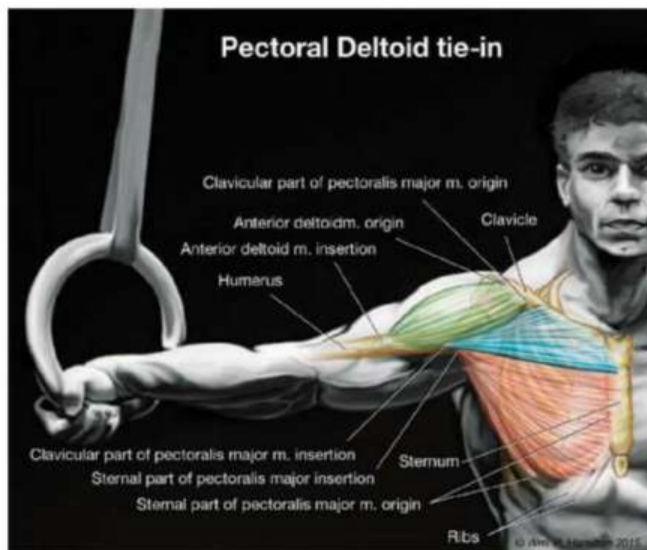
MUSCLE STRUCTURE AND FUNCTION

The two-headed pectoralis major works on the humerus bone of the upper arm, through the shoulder (glenohumeral) joint.¹ The sternocostal head of the pectoralis major begins on the manubrium, which is the top portion of the sternum (breast bone), the upper six costal cartilages near their attachment to the sternum and from the tendinous-like portion of the superior part of the external oblique muscle of the abdominal wall.¹ The clavicular head lies along the anterior lower surface of the clavicle (collar bone).¹ Working together, both heads adduct the upper arm at the shoulder by bringing the arms across the body (the primary function of cable crossovers) and flexing the shoulder joints by bringing the arms forward.^{1,2}

The deltoid muscle begins on the scapula bone (shoulder blade) and attaches on the humerus bone of the upper arm.¹ The anterior fibers of the deltoid are directly and strongly activated by pulley cable crossovers,^{2,3} whereas the fibers on the other two heads are not affected very much by this exercise. The anterior fibers of the deltoid take their origin from the lateral part of the clavicle and they attach to the anterior (front) and upper portion of the humerus bone of the upper arm.¹ These fibers produce strong flexion of the humerus at the shoulder (bringing the humerus bone of the upper arm forward), but they also help to move the arms toward the center of the body (adduction) in cable crossovers.⁴

The angle of the shoulder and arms during the adduction movements of the cable crossovers most strongly activates the middle and inner fibers of the pectoralis major. The greatest activation occurs in the fibers that lie beside the sternum.⁴

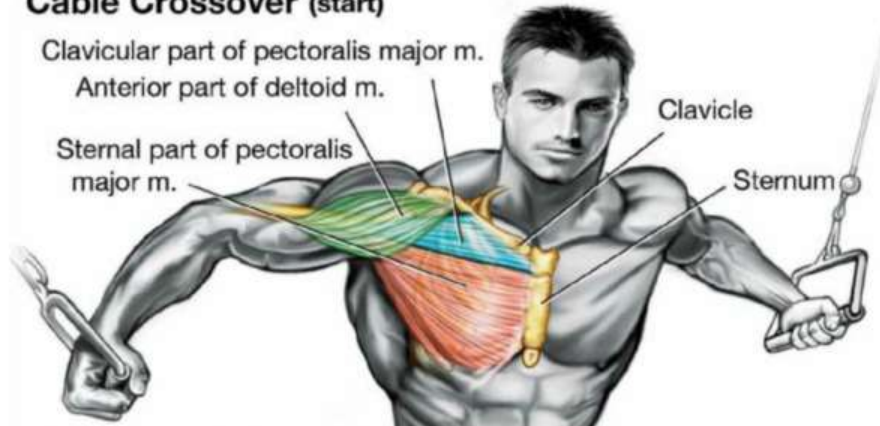
While most people will stop as the hands come together at the bottom of the movement, you can get a more complete contraction if you cross the right hand over the left on one



repetition, then the left over the right hand on the next repetition. If you choose this option, hold the handles for a count of two at the end of each repetition with one hand crossed over the other. The result is that you will experience wildly intensive contractions in your chest that will closely approach a full pectoralis cramp. The inner area of the pectoralis is especially activated when one hand is crossed over the other as far as possible. However, even the lateral-outer parts of the pectoralis are activated when the arms are outstretched in this position, and the inferior pectoralis fibers are recruited as the arms are brought forward.⁶

It is not possible to completely deactivate non-chest muscles during this exercise. The anterior deltoid fibers will contract strongly to assist in moving the arms toward your body

Cable Crossover (start)



Cable Crossover (finish)



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EXERCISE: CABLE CROSSOVERS

This exercise creates a constant tension and this leaves no opportunity for the pectoralis muscles to rest until the set is over. Therefore, you can expect an intensive burn especially during the final few repetitions.

1. Stand midway between two high pulley cables. Take a high pulley handle in each hand. Take a step forward away from the cable machine, so that your hands are just slightly behind but above your shoulders. You should feel a good stretch across the entire pectoral girdle and into the attachments of the sternocostal head of the pectoralis major muscle.

2. Bend your elbows slightly to take any unnecessary stress off this joint and lock them in this position. Do not let the elbows flex and extend during the exercise.

3. With the hands semi-pronated (knuckles should be turned toward each other) pull the handles from the pulley station forward toward each other in an arc so that they come together in front of your pelvis. Stop when the knuckles are about to touch. Pause for a second to keep the tension intense and deep.

4. Slowly move the hands backwards in a large arc, toward the starting position. Inhale deeply as you are moving the handles backwards, and exhale as they are coming forwards.

5. Rest for up to three minutes,⁵ but do not rest too long, and then repeat the sequence.

(adduction) during cable crossovers.^{2,3} The latissimus dorsi and the teres major muscles of the upper back will also assist in adduction of the arm toward the body's midline.⁴ The serratus anterior and the intercostal muscles of the rib cage are also activated during the strong inspiration during which time the arms are abducted and also during expiration when the arms are adducted.^{2,3} Thus, in addition to cutting slices of density throughout your chest, you will activate a host of other muscles of your torso.

Nevertheless, this exercise is about building density in the chest, and it will do that very well! Forget carving the Thanksgiving Day turkey; your best carving can be slicing an exceptional chest at the gym this fall and winter with cable crossovers. ■

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CAN LIGHT WEIGHTS ENHANCE MUSCLE GROWTH?

“LIFT HEAVY TO GROW!”

This mantra has been preached since the early days of weight training. Current research-based resistance training guidelines are consistent with the heavier-is-better mentality, professing that loads below ~65 percent of one-repetition maximum (1RM) primarily build muscle endurance with little effect on increasing muscle size.¹ The contention rests on the premise that heavy loads are required to recruit the full spectrum of motor units (MUs) in a given motor pool.^{1,2} If true, this would substantiate the need to go heavy, since maximal muscle development is dependent on recruiting as many MUs as possible, and keeping them stimulated for a sufficient period of time.

Recently, some in the field have challenged the allegation that heavy lifting is necessary to build muscle. Proponents claim that as long as training is carried out to muscular failure, light-load training will recruit the full spectrum of motor units (and thus muscle fibers), allowing for gains similar to that of using heavy loads.^{3,4} Indeed, there is evidence that fatiguing muscular contractions result in a corresponding increase in electromyographic (EMG) amplitude, presumably driven by an increased recruitment of high-threshold MUs to maintain force output.⁵ Whether EMG findings actually translate into greater hypertrophy remains speculative, however; the true answer can only be determined by training studies that measure changes in muscle size over time.

CONFLICTING STUDY RESULTS

A number of longitudinal studies have been carried out to compare the effects of low- versus high-load training on muscular adaptations. The results of these studies have been conflicting; some show a hypertrophic superiority to heavier lifting⁶⁻⁸ while others show no differences, regardless of the magnitude of load.⁹⁻¹³ A big issue when trying to draw conclusions on the topic is a problem inherent to virtually all long-term



LOW-LOAD TRAINING CAN BE AN EFFECTIVE MEANS TO INCREASE MUSCLE SIZE AND STRENGTH— AND THE POPULAR BELIEF THAT LIFTING LIGHT WEIGHTS CAN'T BUILD MUSCLE CLEARLY IS MISGUIDED.

resistance-training studies—they are very costly and time-consuming to carry out. This invariably leads to small sample sizes and a corresponding lack of statistical power to detect a significant difference between conditions (a so-called type II error). In other words, there might actually be differences favoring one type of training protocol over the other, but statistical measures would not be sensitive enough to observe these differences.

In order to achieve clarity on the topic, my lab recently carried out a meta-analysis encompassing the current body of literature.¹⁴ A meta-analysis converts the results of all relevant studies into something called an “effect size,” which is basically a measure of the magnitude of the effect in a given outcome (in this case, strength and hypertrophy). By standardizing results in this manner, the data can be pooled together and then compared, essentially as one big study. The upshot is that statistical power is heightened, providing a greater ability to detect significant differences between conditions if they do in fact exist.

To be included in our analysis, studies had to be randomized, controlled trials, involving both light- (<60% 1RM) and heavy-load (>65% 1RM) training that spanned at least six weeks, and directly measured muscle hypertrophy and/or strength. Ultimately, a total of 10 studies met our inclusion criteria—nine of which investigated strength as an outcome, and eight that investigated hypertrophy.

The results might surprise you.

NO SIGNIFICANT DIFFERENCES

Contrary to prevailing theory, no significant differences were seen between low- versus high-load training in either strength or hypertrophy, although a trend for greater increases was noted in both conditions. Based purely on statistical probability (i.e., the odds that results are due to chance), this implies that from a strength- or muscle-building standpoint, it really doesn't matter whether you use heavy or light loads, provided training is carried out to muscle failure. While these findings might seem counterintuitive, several

things need to be taken into account when attempting to draw practical conclusions.

First and foremost, statistical trends were noted for greater results in both strength and hypertrophy. Since only 10 studies met inclusion criteria, the trends imply that the statistical power of the meta-analysis may have been insufficient to detect a true difference for the heavy-load condition (the “type II” error previously mentioned). Other statistical measures suggest this was in fact the case. In particular, the pooled effect size for strength was markedly higher in the heavy- versus light-load condition (2.30 versus 1.23, respectively), indicating a large positive difference favoring high-load training. Moreover, all nine studies that investigated strength as an outcome favored high-load training, and six of them showed a moderate-to-strong difference in magnitude of effect. Considering the totality of the evidence, it can be concluded with confidence that maximal strength gains require heavier loads.

Differences in effect sizes were also seen for hypertrophy outcome studies, with an advantage seen for high versus low loads (0.82 versus 0.39). While the effect size differential wasn't as great as that seen for strength, it nevertheless distinctly favored the use of heavier weights. Combined with the fact that increasing strength would allow for greater mechanical tension during hypertrophy training¹⁵, it would appear that at least some heavy-load training is needed if the goal is maximal hypertrophy.

ADVANTAGE OF HEAVIER LOADS

In summary, results of the meta-analysis provide compelling evidence that low-load training can be an effective means to increase muscle size and strength—and the popular belief that lifting light weights can't build muscle clearly is misguided. That said, there does appear to be an advantage to using heavier loads for maximizing muscular adaptations. It is interesting to speculate that combining high and low loads might be the ideal approach from a hypertrophy standpoint. Recent work from my lab shows significantly greater

mean and peak muscle activation when performing the leg press at 75 percent of 1RM compared to 30 percent of 1RM.¹⁶ One caveat: The light-load set lasted three to four times longer than the heavy-load set, indicating that fibers activated during light-load training received considerably greater time under load. Given the fact that type I fibers have a higher fatigue threshold, the greater time under load provided by low-load training would conceivably stimulate these fibers to a greater degree than the use of heavy weights. Hence, it can be hypothesized that performance of heavier load sets will best target the type II fibers, while incorporating lighter-load training will provide an optimal hypertrophic stimulus to the endurance-oriented type I fibers.

A primary limitation of the current literature is that the relevant studies have been carried out exclusively in untrained individuals—and as I'm sure you know, newbies don't respond to intense training in the same manner as hardcore lifters. The good news is that I'm in the process of completing a study on the topic with subjects who are highly experienced in resistance training. Stay tuned! ■

Brad Schoenfeld, Ph.D., CSCS, FNSCA, is widely regarded as one of the leading authorities on training for muscle development and fat loss. He has published over 60 peer-reviewed studies on various exercise- and nutrition-related topics. He is also the author of the best-selling book, *The M.A.X. Muscle Plan* and runs a popular website and blog at www.lookgreatnaked.com.

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A CONSISTENT JOURNEY OF LIFTING

In a fast-paced world, everyone wants instant results. Too often in this industry that means people who want results without putting in work and staying patient with a plan.

With that in mind, I want to tell you about a consistent journey that has been going on for more than 20 years. That journey, of course, would be my time in the weight room. Now 20 years is a hell of a long time, and certainly a lot longer than the person who wants results in 30 days. So when people ask me the secret or the perfect plan, my answer usually goes something like, "I don't do anything extra special, but I just never fucking miss." I really love

lifting weights and I truly am passionate about it. If you want a magic plan, there it is.

My journey started like most: I was small and wanted to improve my strength, build muscle, get bigger and build confidence. Luckily, weightlifting was a generational thing in my family passed down from my great grandfather and grandfather. My parents worked out when I was young and my grandfather taught me the ropes when it came to being consistent, putting in the work and getting strong.

That journey started when I was in sixth or seventh grade and I have only missed the summer of my freshman year since then.

That's consistency; that's 20 straight years of not missing more than a week in the gym, and that's the key to success in the iron game.

Like Arnold always talked about, you have to find a reason to be passionate about lifting. It can truly be anything. For me, early on it was a great release for somewhat of an angry youth. My parents divorced when I was 11 and lifting became an incredible outlet, not only as a release but to stay positive. I looked up to legends like Arnold and Franco and started to study everything they did. Like so many, I wanted to look like them, which made me dream about being on magazine covers and being a famous fitness guy.

I was in high school at that time and I had no idea how I was going to make that happen, but I absolutely loved everything the iron gave me. It was the perfect way to blow off steam, help me with sports and just give me confidence that I could accomplish things. It really took over all of my thoughts, from when I woke up to when I went to bed. As soon as I got home I hit the weights with my grandpa, and those are memories I'll never forget. But the progress was awesome to see because I was so passionate and willing to work. I was just happy I had found something I instantly loved.

In high school I got into powerlifting meets, and that was it. My dream was to move away and purchase a gym. To get there, I worked at a sawmill and then a coal mine, saving enough money to begin my dream. No matter how far-fetched it seemed, it was my passion and I was going to make it happen. I opened my first gym when I was 20 for \$5,000 and that started my grind. I have owned a gym for almost 16 years now and have been a fitness professional nearly my entire adult life. In short, I turned my passion into reality because that's how bad I wanted it.

I now run and am the co-founder of one of the biggest supplement companies in the industry, MusclePharm, and I've been fortunate enough to be featured on nine covers, including two with FitnessRx. As far as lifting, I recent squatted 550, benched 350 and deadlifted 575 at a powerlifting meet, weighing 198 pounds, and I am still as passionate as when I first picked up the weights. Lifting still does the same thing it did for me almost 20 years ago and it completely carries over into every aspect of my life. It drives me, stabilizes me and is the perfect counterbalance to any steam I may have to let off in any area of my life.

The iron doesn't care about what kind of day you had, how much money you have or how cool you may think you are. It's up to you to prove yourself every day in the gym, and that's why I'm so dedicated to it. It's a constant challenge, it's kept me honest and it's always been good to me. Find that passion in the weight room, multiply it over several years and you'll be amazed at the journey it can provide. ■

BIOGRAPHY

Cory Gregory co-founded MusclePharm with Brad Pyatt in 2008 and serves as Executive Vice President. A former underground coal miner, Gregory worked diligently to save money to realize his dream of opening his own gym by the age of 20. In the last 15 years, he has gained extensive experience and has received a number of accolades within several aspects of the fitness industry. Obtaining an Exercise Specialist certificate from Columbus State, Gregory is also NESTA nutrition coach certified and Westside Barbell certified. In addition to his in-depth knowledge of bodybuilding and nutrition, he is a CrossFit Level-1 trainer further helping MusclePharm's athletes and ambassadors achieve their fitness goals. Gregory prides himself on embodying the MusclePharm culture, as he has been featured on the cover of top fitness magazines, including FitnessRx. Weighing just 208 pounds, he has achieved a powerlifting total of 1,755 pounds, culminating in a career-best 700-pound squat. Most recently, Gregory was added to the Arnold Schwarzenegger Fitness Advisory Board.



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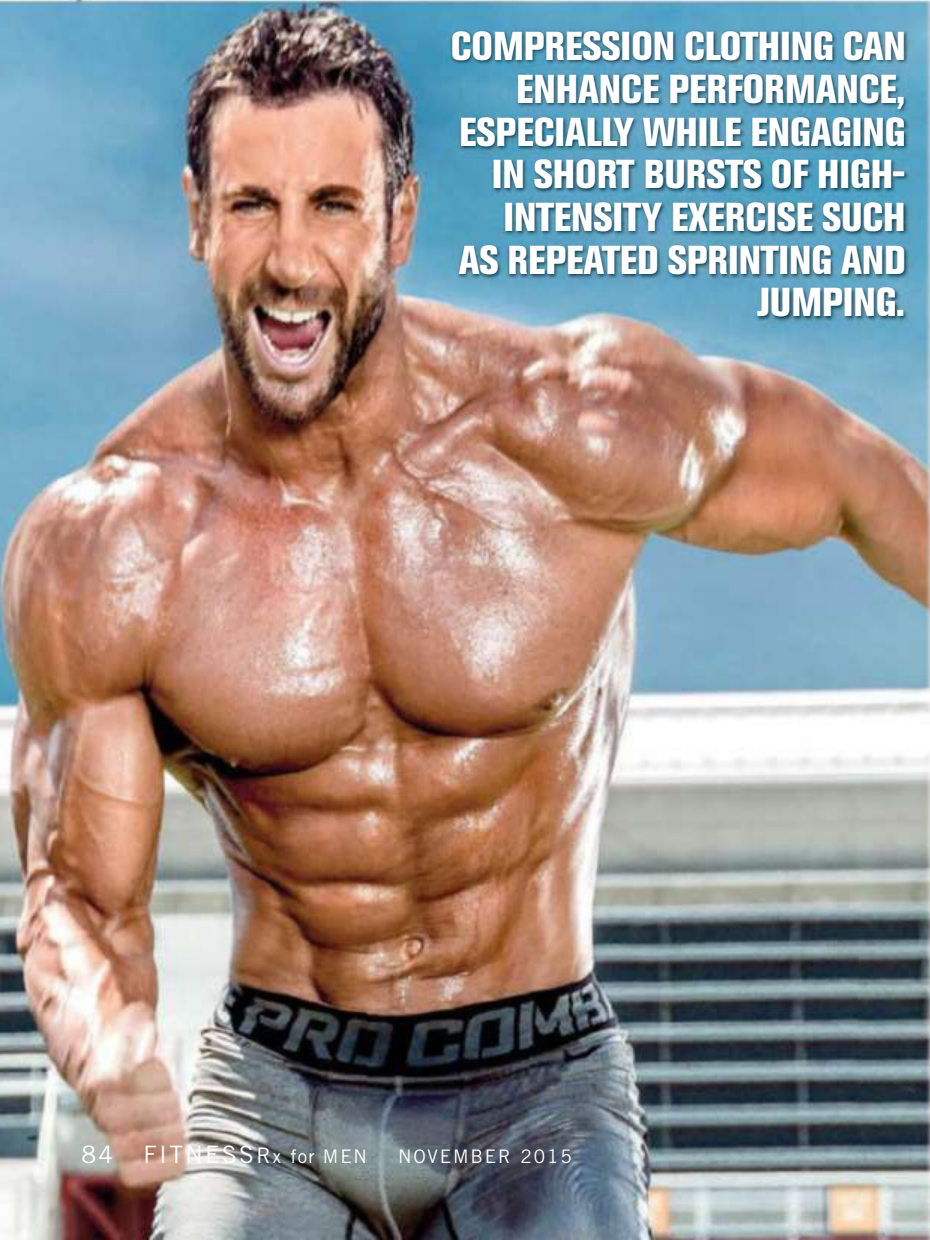
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BOOST PERFORMANCE AND REDUCE SORENESS WITH COMPRESSION GARMENTS

The use of compression clothing such as elastic shorts, full-length tights and knee-high socks has recently become more common among athletes and fitness enthusiasts. The increased use of compression clothing is likely due to accumulating scientific evidence showing enhanced exercise performance^{1,2} and muscle recovery^{3,4} when using compression garments.



**COMPRESSION CLOTHING CAN
ENHANCE PERFORMANCE,
ESPECIALLY WHILE ENGAGING
IN SHORT BURSTS OF HIGH-
INTENSITY EXERCISE SUCH
AS REPEATED SPRINTING AND
JUMPING.**

ENHANCED BLOOD FLOW AND MUSCULAR ENDURANCE

While initial studies investigating the use of compression garments for medical purposes showed a reduction in blood clot formation within the veins of postoperative patients that were prone to clot formation due to inactivity from being bedridden, these patients also demonstrated an increase in venous blood flow within their lower extremities. The increased blood flow led scientists to believe that compression garments could also improve exercise performance, as increased blood flow would bring more essential nutrients and oxygen to laboring muscles while simultaneously removing metabolic waste, which would collectively enhance muscular performance during exercise.

Well, it turns out that several studies have demonstrated the positive influence of compression garments on blood flow, and that the use of compression garments does improve muscular endurance, especially during maximal-intensity endurance training.^{5,6,7} For example, one study in particular⁸ examined the effect of wearing waist-to-ankle compression garments on active recovery after high-intensity treadmill running, with one training session incorporating the use of compression garments and a second session having each test subject exercising in regular running shorts. After each training session, blood samples were collected to determine levels of the metabolic byproduct lactate in the blood, and heart rates were also measured. The results of this study indicate that wearing compression garments augments the active recovery process by reducing lactic acid levels and lowering heart rate after high-intensity training.

BOOST STRENGTH AND POWER OUTPUT

The positive influence of compression garments doesn't simply stop with enhanced endurance, as maximal strength and power can also be improved with the use of compression clothing.² This effect likely stems from the rather unique capacity of compression garments to improve overall body movement and joint mechanics by enhancing a process known as proprioception, which is essentially the ability of the central nervous system to perceive body position and movement.^{4,9} Proprioception is a highly advanced system regulated by a variety of neural pathways coming from receptors in the skin, muscle and ligaments.^{2,3,10} The enhanced proprioception believed to be triggered by compression garments is mediated by receptors in the skin, known as mechanoreceptors, which are activated by the tension created from the compression garment. Greater activation of these mechanoreceptors increases feedback signals to the central nervous system¹¹, which fine-tunes the perception of body and joint motion, ultimately improving proprioception.^{12,13} The enhanced proprioception likely improves control of all proprioceptors within this system, including those within muscle tissue that have the ability to increase muscle cell activation and muscle fiber recruitment, which should improve muscular strength and power.

While studies¹⁴ have reported mixed results regarding gains in strength when using compression clothing, a recent review of the literature by Born et al.¹⁵ revealed several positive results associated with the use of compression clothing in specific types of strength and power displays, such as sprint performance and vertical jumping. As a matter of fact, improvement in short sprints separated by short recovery periods was shown to rely heavily on several different metabolic and neuronal factors that enhanced muscle activation and muscle fiber-recruitment strategies¹⁶, indicating that improved proprioception, caused by the use of compression garments, played a significant role in improving sprint performance.

IMPROVE THE RATE OF MUSCLE RECOVERY

Weight training can induce muscle damage, especially when performing new training regimens or movements involving a lot of eccentric muscular contraction.¹⁷ The resulting muscle soreness is accompanied by a feeling of stiffness within the exercised muscle groups¹⁸ as well as a loss of strength and range of movement,

also within the trained muscle groups.^{19,20} Some have claimed that compression garments can attenuate the negative symptoms associated with muscle damage by providing mechanical support to the injured muscle tissue, thus lowering the requirement for activity of the damaged muscle tissue, which will most certainly speed up the healing process.²¹

In fact, research has clearly shown that wearing compression sleeves for several days, following a muscle-damaging training session, does actually lead to a more rapid reduction in blood concentrations of the muscle damage marker creatine kinase, indicating a greater rate of recovery. Reductions in muscle soreness and decreased range of motion have also been observed when using compression garments, further indicating a greater rate of muscle recuperation.²¹

The squeezing effect from compression garments has also been shown to minimize swelling of the damaged muscle tissue by increasing the flow of lymph fluid from the lymphatic system, in a process known as lymphatic outflow. Since some of the swelling that occurs in muscle tissue is due to an increased pooling of lymph fluid within the muscle, the increased efflux of lymph from the muscle tissue caused by compression garments reduces post-exercise muscle swelling and pain.²¹ In fact, one study in particular looked at the effect of compression clothing, showing that reductions in muscle swelling when using compression clothing 24 to 48 hours after exercise was complete.¹⁴ Moreover, this reduction in swelling corresponded to improved recovery of muscular strength and power.

In conclusion, it is pretty clear that compression clothing can enhance performance, especially while engaging in short bursts of high-intensity exercise such as repeated sprinting and jumping. This is likely because this form of anaerobic work generates high amounts of lactic acid, which reduces muscular function—and compression garments effectively remove lactic acid from muscle tissue, ultimately promoting a longer duration of muscular function. Additional benefits of compression clothing use also involves a greater rate of muscle recuperation stemming from the capacity of compression garments to reduce levels of muscle damage, swelling and soreness, resulting in greater recovery rates. Moreover, the improved recovery seems to be most pronounced when compression is applied for as long as one to two days after engaging in damage-inducing exercise to the muscle. ■

For most of Michael Rudolph's career he has been engrossed in the exercise world as either an athlete (he played college football at Hofstra University), personal trainer or as a research scientist (he earned a B.Sc. in Exercise Science at Hofstra University and a Ph.D. in Biochemistry and Molecular Biology from Stony Brook University). After earning his Ph.D., Michael investigated the molecular biology of exercise as a fellow at Harvard Medical School and Columbia University for over eight years. That research contributed seminally to understanding the function of the incredibly important cellular energy sensor AMPK—leading to numerous publications in peer-reviewed journals including the journal *Nature*. Michael is currently a scientist working at the New York Structural Biology Center doing contract work for the Department of Defense on a project involving national security.

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IS YOUR MULTIVITAMIN KILLING YOU?

ADVERSE HEALTH EFFECTS FROM IRON, COPPER, MANGANESE AND CALCIUM

A healthy diet includes the correct amount of essential vitamins and minerals that sustain many important biochemical processes within the body, promoting normal bodily function and overall good health. Unfortunately, the modern diet is typically nutrient-deficient—meaning most people do not consume the daily requirement for many of these essential vitamins and minerals, increasing the risk for several life-threatening diseases.¹

In an attempt to address this nutritional shortcoming, the multivitamin was designed to provide many of the required vitamins and minerals to promote better health. However, recent scientific evidence indicates that many multivitamin products on the market today might actually impede overall health by supplying an excessive amount of certain minerals such as iron, copper, manganese and calcium, leading to increased oxidative stress. The accumulation of oxidative damage caused by too much mineral intake then triggers an immune response, which promotes a chronic state of inflammation.

Chronic inflammation—unlike acute inflammation, which protects and heals the body following physical injury or infection—is not beneficial. In fact, chronic inflammation is involved in a number of disease states. For instance, chronic inflammation in fat cells is closely related to the development of insulin resistance and type 2 diabetes.² Similarly, chronic inflammation can damage the coronary arteries, promoting cardiovascular disease³, or stimulate the initiation of cancerous tumors.⁴

CHRONIC DISEASE AND EXCESS IRON, COPPER AND MANGANESE

One of the minerals that appears to contribute most potently to the disease state is iron, especially when taken excessively. Iron is an essential trace element, typically found in the body bound to protein molecules, where it facilitates numerous biological processes essential for life. While we need iron to be healthy, too much iron intake apparently overwhelms the body's storage capacity, resulting in inflammation and ultimately chronic disease.

Iron is found in the body in two forms; one form is bound to the prosthetic heme group while the other is in a free form,



SCIENTIFIC EVIDENCE INDICATES THAT MANY MULTIVITAMIN PRODUCTS ON THE MARKET TODAY MIGHT ACTUALLY IMPEDE OVERALL HEALTH BY SUPPLYING AN EXCESSIVE AMOUNT OF CERTAIN MINERALS.

unbound to heme. The free form of iron can be harmful because it reacts with other compounds in the body, producing free radicals that can cause irreparable oxidative damage to key components of the cell including proteins, lipids and DNA.

Because of the potential harm caused by the free form of iron, when inside the cell, the free form of iron is stored inside a protein called ferritin, which prevents the unwanted release of iron to avoid oxidative damage. In fact, studies have shown that increased dietary iron intake increases cellular levels of ferritin to provide greater storage capacity for the additionally ingested iron. However, quite unexpectedly, the greater ferritin levels caused by iron intake also trigger inflammation⁵, increasing the risk for obesity⁶, diabetes^{5,7} and even Alzheimer's disease.^{8,1} This is likely because higher ferritin levels function as a signal to the body that a lot of iron is around. So, the body responds to this signal by activating the immune system, which has the unique capacity to prevent the release of iron from the primary iron-storage site, the

liver. So, essentially, the body is doing its best to lower serum iron levels by activating the immune system, despite the fact that this could lead to chronic inflammation and disease. Furthermore, inflammation from too much iron intake may also be due to iron intake exceeding the storage capacity of ferritin, resulting in the release of free iron into the cell, causing additional oxidative damage and inflammation.

As a result, the use of iron-containing supplements doesn't seem to be such a good idea, as this will likely lead to excessive iron intake—especially considering that most individuals already consume generous amounts of iron from the diet, as many common foods are heavily fortified with iron such as cereals, bread and pasta. So supplementing a diet loaded with iron-fortified foods will probably lead to the consumption of too much iron, which may cause the aforementioned increases in oxidative stress, inflammation and disease.

Comparable to iron, the element copper also generates oxidative damage, particularly in neurons—making too much copper intake unhealthy. In fact, evidence shows that ingestion of copper from supplement pills, along with a

high-fat diet, contributes to the onset of Alzheimer's disease.⁹ This study also showed that serum copper levels were elevated in patients with Alzheimer's disease, and higher copper levels correlated with loss of cognition. In addition, copper accumulation in certain tissues has been associated with certain pathologies including cancer, as copper can contribute to the growth of certain cancers while increasing cancer metastasis in other forms.^{10,11}

Excessive consumption of the element manganese has also been identified as a health risk, as accumulation of manganese in the central nervous system promotes neurotoxicity—resulting in the neurological brain disorder manganism. In addition, elevated serum levels of manganese have been found in different neurodegenerative diseases, including Parkinson's disease^{12,13,14}, where manganese has been shown to promote the production of the abnormal protein aggregates called Lewy bodies that apparently contribute to Parkinson's disease.

Manganese's deleterious influence on health is likely due, in part, from oxidative damage within the body, as manganese can also generate free radicals in a similar fashion to iron and copper. Manganese also tends to accumulate in specific cells in the brain called the astrocytes, causing them to malfunction. Since the astrocyte normally provides essential nutrients to neurons, malfunction of the astrocyte prevents the required nutrition for the neuron, thus depleting neuronal function and promoting neurodegeneration.¹⁵

TOO MUCH CALCIUM INCREASES CARDIOVASCULAR RISK

Calcium intake has been promoted for quite some time, because of its apparent ability to improve bone health. Calcium is also required for many other essential bodily functions including nerve function, muscular contraction and the regulation of certain hormones.¹⁶ As a result, most multivitamins contain a considerable amount of the daily recommended allowance for calcium.

However, a few recent studies indicate that calcium supplementation may not be as beneficial to bone health as once thought, and may actually be detrimental to cardiovascular health. The first report states that while calcium may slow bone loss to some degree, there is no significant reduction in fracture

prevention.^{14,17} In a second report by the National Institutes of Health, it was shown that calcium supplements, not dietary calcium, increased the risk of death from cardiovascular disease.^{12,18}

In closing, the use of multivitamin supplements loaded with inflammatory-inducing minerals appears to be counterproductive with respect to one's health, as extraneous amounts of these minerals may result in disease instead of good health, especially when taken over longer periods of time. ■

Advanced Molecular Labs' (AML) Thermo Heat Multi is the first multivitamin and mineral supplement formula without iron, copper, manganese and calcium. For more information, go to advancedmolecularlabs.com.

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Yes, you read that right— what you consume not after your workout but *during* it may be even more important than you thought. Taking in the right macronutrients and micronutrients as well as key anabolic nutrients can play a huge role in how fast you recover from your workout and even how much muscle you can put on. If this got your attention, then listen up— because the latest release from Body Fortress® has already got the training forums going crazy.

MULTIDIMENSIONAL PERFORMANCE MATRIX

Now while many formulas on the market are one-dimensional, Super Amino Hydra-Blast is anything of the sort. In fact, it targets the most important aspects for active individuals and athletes of all sports alike. It helps dial in the critical aspects for improving not only your physique and performance, but also your rate of recovery. For those who are in the know, the faster you recover, the more training volume your body can handle, which leads to better gains. So let's take a look at this awesome formulation and what it can do to help take your results to the next level.

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If you thought that was all they had to offer, think again. Body Fortress® went above and beyond to give you what other companies did not. This combination of L-taurine, sodium chloride and potassium citrate will help provide clean, crisp energy without a jittery feeling. It provides key electrolytes that are critical for muscle performance and hydration. Nothing is more important when you are training in the heat. This will keep you fresh and ready to go.

ONE AMAZING FORMULATION

With just one look at this formulation, you can see why it is such a hit with athletes all over the world. It provides not one but three separate complexes to help jack up your performance, maximize recovery and provide optimal performance both in the gym and on the field. So if you have been neglecting your intra-workout nutrition, now is the time to take full advantage of all it has to offer you. If you are old school and think that a protein shake after your workout is enough, then it's time to get rid of the 1980s Walkman, take off that fanny pack, and join the year 2015. Super Amino Hydra-Blast from Body Fortress® is just the formula to make your goals a reality. ■

SUPER AMINO HYDRA-BLAST

- The ultimate intra-workout sensation
- Improves performance and increases strength
- Helps rate of recovery between training sessions
- Prevents the body from entering a muscle-wasting state
- Prevents cramping and hydrates like no other
- The most advanced multidimensional matrix available

5 WAYS TO PRESERVE MUSCLE WHEN DIETING

Q EVERY TIME I DIET DOWN FOR A SHOW, I LOSE SO MUCH HARD-EARNED MUSCLE. I FEEL LIKE I AM DOING SOMETHING WRONG. COULD YOU PROVIDE SOME LPLFUL TIPS TO AID ME WHEN DIETING?

This is an excellent question, and one of the most commonly misunderstood parts of prep for competitors. I am going to give you my five tips for preserving muscle when dieting.

1. Keep caloric deficit to 12 to 15 percent MAX of your current intake. Dieting at too far of a deficit will start to slow down metabolic rate, immediately slowing fat loss. Every four to five days, have one day where you do not hit deficit.

2. To quote my friend Dr. Layne Norton with reference to cardio: "Cardio should be like the length of a woman's skirt—long enough to cover the subject, but short enough to keep it interesting." The biggest mistake you can make is doing tons of cardio, which will absolutely result in significant muscle loss. For some reason people think that burning 500 calories is 500 fat calories. Not even close. When you burn calories via any type of steady-state cardio, you burn approximately 60 percent fat, 40 percent muscle. Keep cardio short

and sweet: 15 to 20 minutes of high-intensity interval training two to three days per week. Doing excess cardio is NOT going to increase your rate of fat loss. It will only increase your rate and ratio of muscle loss!

3. Do some real sprints. I say real sprints because sprinting on a treadmill is not sprinting. The belt moves for you and there is subsequently no leg drive. Intense sprinting sessions are a great way to increase growth hormone production, burn body fat and preserve fast-twitch muscle fibers. Take things to a new level with hill sprints and parachute sprints!

4. Lift heavy! For some reason, in the final few weeks of prep, people like to lighten the weights and do higher reps. This makes absolutely zero sense. Lifting heavy and intensely directly affects mTOR, which regulates muscle protein synthesis. So to maintain muscle when dieting the final few weeks, when energy levels are low, reduce the volume of sets and reps by as much as 50 percent, but keep the weights and intensity high!

5. Implement intermittent fasting (IF). Gone are the days of "bro science" myths such as you need to eat every two to three hours in order to prevent catabolism (muscle loss). Intermittent fasting promotes the secretion of GH, which promotes fat loss and muscle preservation. IF also increases insulin sensitivity, which is good for the mobilization of adipose tissue. ■

THE BIGGEST MISTAKE YOU CAN MAKE IS DOING TONS OF CARDIO, WHICH WILL ABSOLUTELY RESULT IN SIGNIFICANT MUSCLE LOSS.

FOLLOW JOE

On Instagram @JoeDonnellyfit, or his online training and nutrition website at www.JoeDonnellyfitness.com.

Have a question for Joe? You could see it answered in the next issue! Email your question to Joe at FITNSRX@gmail.com.

YOUR **BEST** TRAINING PARTNERS

PREWORKOUT POSTWORKOUT



COMPARE FOR YOURSELF

A Comparison of Active Ingredient Amounts in AML PreWorkout with 8 Top Competitors

	Caffeine Anhydrous	Citrulline Malate	Creatine Monohydrate	Betaine	Beta-Alanine
	AMOUNTS PER SUGGESTED SERVING				
PREWORKOUT	400mg	6g	5g	2.5g	2g
COMPETITIVE BRAND #1	DU-PB	NONE	1g (as Creatine Nitrate)	DU-PB	1.6g
COMPETITIVE BRAND #2	DU-PB	NONE	DU-PB	DU-PB	NONE
COMPETITIVE BRAND #3	DU-PB	DU-PB	DU-PB	DU-PB	DU-PB
COMPETITIVE BRAND #4	175mg	15g	3g	NONE	1.5g
COMPETITIVE BRAND #5	DU-PB	NONE	NONE	NONE	NONE
COMPETITIVE BRAND #6	190mg	NONE	NONE	NONE	1.6g
COMPETITIVE BRAND #7	DU-PB	NONE	NONE	NONE	2g
COMPETITIVE BRAND #8	350mg	6g	2g (as Creatine HCl)	NONE	1.6g

DU-PB = Dosage Unavailable, Proprietary Blend
 = Highest Dosage

A Comparison of the Top 3 Proven Post-Workout Nutrients

	L-Leucine	Creatine Monohydrate	Betaine
	AMOUNTS PER SUGGESTED SERVING		
POSTWORKOUT	4g	5g	2.5g
COMPETITIVE BRAND #1	DU-PB	NONE	NONE
COMPETITIVE BRAND #2	2.5g	NONE	NONE
COMPETITIVE BRAND #3	DU-PB	NONE	NONE
COMPETITIVE BRAND #4	DU-PB	NONE	NONE
COMPETITIVE BRAND #5	2.5g	NONE	NONE
COMPETITIVE BRAND #6	2g	NONE	1.25g
COMPETITIVE BRAND #7	DU-PB	NONE	NONE
COMPETITIVE BRAND #8	3.6g	2g (as Creatine HCl)	1.5g

SCIENCE > INNOVATION > RESULTS

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